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Rough Notes of an Exploration for an Inter-oceanic Canal Route by way of the Rivers Atrato and San Juan, in New Granada, South America.

By JOHN C. TRAUTWINE, Civ. Eng., Philad.

Continued from p. 11.*

This afternoon the rain commenced at five o'clock, and continued with intervals during the night. The river, however, fell four inches.

Early next morning, after a cup of coffee, we started with the intention of breakfasting in Baudó, which we were told was about half a day below.

Some two miles below our starting place, we passed a rock bluff, fifty feet high, composed of the gray indurated clay, with fragments of shells.

At noon, having traveled sixteen miles, we reached the mean little town, village, or whatever it may be called, of Baudó. (See Plate II.) It is situated on the west bank of the river, fifty-four miles below where we embarked upon it; and, as we afterwards found, twenty-four miles above its outlet into the Pacific.

Thus far we have seen the Baudó in about its ordinary stages, or perhaps a trifle below them, inasmuch as the line of no vegetation was everywhere a little above water. With the exception of those spots at which low hill spurs, or bluffs, presented themselves, the adjacent land on both sides was flat and swampy, especially a little back from the banks.

* ERRATA.—Page 9, 12th line from bottom, for 85 miles, read 78 miles.

The height of the levees above the water, as we saw it, generally ranged between five and ten feet as extremes; and throughout all their extent they are occasionally overtopped by the floods. At the village, we found the bank at the water's edge to be ten feet above the water when we arrived; but were shown marks of a freshet which had submerged it from six to eight feet, rising about three feet above the floors of the highest huts.

The narrow strip of soil between the levee and the foot of the hills immediately back of the town is all swampy; and even the top of the levee is kept so soft by the incessant rains, that rows of stout poles are laid along it by way of paving.

Here the width of the river is 110 yards; and this limit is rarely exceeded between the town and the ocean.

Precisely opposite the village, the little River Pepé comes in from the East. (See Map XII. vol. xxvii.)

A few rods above their junction, the Baudó gave soundings of twenty feet for nearly half its width; and at a few rods below, of thirty feet for the same distance.

The current was 2¼ miles per hour at this time; but when, some days afterwards, we reached here again from the Pacific, the water had risen about five feet, and the current had increased to near 2½ miles per hour in the swiftest part of the cross-section.

We were told that when the Baudó was at its very lowest stages, the influence of the Pacific tide was sensibly perceived, not only here, but for some distance above.

This I presume to be the fact, for I suspect that the average fall of the Baudó from the village to the ocean, cannot *exceed* about three inches to a mile, or six feet in all; while I found the rise and fall of the Pacific tide at the mouth of the stream to be but about eight feet, instead of some twenty feet, at Panamá.

The village contains a church, (seen on the left of the sketch;) and about a dozen cane huts, with floors elevated three or four feet above the top of the levee. The largest and least inconvenient of these belongs to Señor Antoine Posso, a Frenchman, who, after having for several years resided in various parts of New Granada, at last took it into his head to settle down like a frog in this piece of swamp, some three feet below high-water mark. It is utterly inconceivable how any rational being, and especially a Frenchman, can prevail on himself to abjure civilization, and deliberately resolve to vegetate away his life in a horrible out-of-the-way hole like this. But Señor Posso appears to be charmed with it; perhaps on the principle of "better be first in a village than second in Rome."

He was standing on the bank when we arrived; and on our hailing him in bad Spanish, to inquire where Señor Posso lived, he responded in equally bad English, that he was that individual. We had a letter of introduction to him from Governor Conto; but before we had time to present it, we had been cordially welcomed, and ushered into his abode.

Our provisions had entirely given out the day before,—the mustard only remaining faithful to the last. We were therefore constrained, rather late in the afternoon, to venture a gentle insinuation that we had not yet

J. C. T. del.

P. S. Duval & Coʳ Steam Ith Press Philad.ª

BAUDO.

breakfasted. To our dismay, we ascertained that Baudó was the last place in the world in which to replenish our exhausted larder; and were compelled to the unpleasant conviction, that not only would it be entirely out of the question to procure supplies here for our remaining voyage, but that it even subjected our kind-hearted host to no little inconvenience to administer to our immediate wants, especially as we were regarded as coming decidedly under the head of "illustrious strangers."

Señor Posso contrived, however, to procure a chicken, which, with some rice and plantains, made us an excellent breakfast.

The afternoon and night being showery, and suggestive of in-door contemplation, Señor Posso concocted the essential elements thereof, in shape of a mixture of mata burro or kill donkey, panéla or coarse brown sugar, mantéca or liquid lard, and hot water. He then despatched an emissary, to invite the Cura to partake with us of his good cheer. The invitation was accepted, to our great gratification, inasmuch as the Cura proved to be an agreeable, well informed, and highly estimable person. His pastoral charge is one of considerable extent, embracing stations widely distant from each other. Among them are Baudó and Noanimá, the latter, an Indian village on the San Juan, and his head quarters.

We passed the evening very agreeably, in desultory conversation, chiefly respecting our several countries.

During intervals, I took lessons in segar-making from master Napoleon Posso, a bright, intelligent looking, little son of our host and a native mother.

Society here is characterized by a nonchalance, of which occasionally the most agreeable feature to our uninitiated selves was its novelty. An instance of it occurred to interrupt our conversation this evening.

A strapping, naked black fellow very unceremoniously entered the room, and without as much as a "by your leave," lay down on a table a few feet from us, to take a snooze. The position he assumed was such, that had he been a bomb, an accidental discharge would have placed our lives in imminent danger, inasmuch as he completely commanded our position, and would have raked our table fore and aft. Under ordinary circumstances, this incident would probably have passed unnoticed as an every day occurrence; but under the actualities of the occasion, Señor Posso very properly deemed it but a courteous concession to the clerical position of the Cura, and a manifestation of respect to the Doctor and myself as strangers, not to let it pass without a reprimand. He accordingly read the brute a sharp lecture on the impropriety of his conduct; but received for a reply, that the intruder considered himself a true citizen, and a thoroughgoing "Democratico," and as such, did not choose to inconvenience himself by any squeamish respect to the Cura, the strangers, or any one else. This said, he instantly brought his guns to bear even more fully upon us, by way of a practical illustration of his sentiments. Hereupon, the Cura calmly, but with severity, addressed him a few words, which evidently staggered him. I then threw in a cross-fire, telling him that we had many Democrats in our country; but that they did not, like him, consider a Democrat and a blackguard synonymous terms; and that in my opinion, his appropriate dormitory was the pig-pen. Our triple alliance prevailed, for the fellow sullenly rose from the

table, and without a word of reply quietly left the house. As he did so, a very emphatic sniggering outside proved that popular sentiment was with us, and that the decency party had achieved a glorious triumph. This was the only specimen of the genuine blackguard I ever met with in New Granada.

When we retired for the night, the room assigned to our use was tenantless, save by ourselves; but when we awoke at early dawn, we found that during the night the rain had driven about a dozen outsiders into it through the windows.

Next morning, after one more ineffectual effort to procure provisions for our voyage, we took a cup of chocolate; and started off for the mouth of the river, trusting to our fowling-piece for breakfast and dinner.

Notwithstanding the rain of the night, the river fell three feet.

Some five miles below Baudó, at a spot where the river is 100 yards wide, we found a depth of but 14 feet for nearly the whole width; with, however, a narrow channel-way of 18 feet near the concave side. This is about as unfavorable a section as any we had met with since entering the Baudó, except near the upper part, where we occasionally had but 14 feet as the greatest sounding. This spot is about one-third of a mile below the entrance of the Misará or Neguá, a stream of 100 feet in width; and the shoalness is probably caused by the deposition of matter brought down by that tributary. I doubt whether, in the very lowest stages of the river, there is ever less than nine feet depth of channel-way even here. All our other soundings between the town and the ocean, gave channels of from 20 to 30 feet, until we reached the little bay at the mouth. This bay is about one and a half miles long, by three-fourths of a mile average breadth; and at low water, has but from four to nine feet depth over almost its entire area.

Outside of the mouth of this bay is a bar which completely precludes the entrance of any thing but the fishing canoes of the natives. We approached this in many places as closely as the breakers would permit, into three feet water, but saw it completely dry throughout the greater part of its extent; and reaching, as nearly as we could judge by eye, a full mile out from the beach.

The rise and fall of the tide was between eight and nine feet; instead of about twenty feet as at Panamá; and we afterwards found about the same at the mouth of the San Juan, some fifty miles more to the south.

At the mouth of the river, and on the beach, we saw several very large caymans or alligators. There are also tigers in the hills bordering the banks. Frequently, under cover of darkness, both animals visit the huts and abstract an unfortunate porker.

The people are very apprehensive of attacks not only from tigers, but from alligators. My own opinion, however, is, that their fears are nearly, if not entirely, groundless. I have, on numberless occasions, been fully exposed to both; but have never perceived the slightest disposition manifested by either, to attack human beings. It is not improbable that, under the instigation of extreme hunger, they may do so; and perhaps, some such occasions have given rise to the fear that so universally prevails in all parts of this country that I have visited.

The hills, shown on the Map, (Plate XII, vol. xxvii,) and which the

Baudó generally intersects nearly at right angles, are laid down correctly in number, and very approximately so in position. None of them appeared to exceed above 300 feet in height, and many of them were less than 100 feet. They are all densely covered with trees and undergrowth.

The intervals between these hills is swamp-land, like that bordering the other portions of the river. For some five leagues above the mouth, the wetness of these swamps precludes all attempts at cultivation; nor are any huts erected throughout that distance, except the two or three miserable ones at the very mouth of the bay. The only spots available for this purpose, would be the sides of the hills. From these, also, fuel for steamboats would have to be cut, as there is scarcely any fit for the purpose in the low grounds.

We reached the mouth of the river after dark, on the same day that we left Baudó.

We however caught a glimpse of the broad Pacific, just as the sun was setting gloriously into its placid waters. It was the first sunset we had seen for about two months; and none but those who had been for a long time deprived of the noble sight, can imagine the emotions it awakens. Doctor Halsted and myself, waxed sentimental on the occasion for a few minutes, and should probably have indulged in some brilliant rhapsodies, had not our empty stomachs positively forbidden such ebullitions of fancy. Not a single breakfast had we seen fly across the river during the whole day; and as the sunset was immediately succeeded by dense clouds and pitchey darkness, we were very reasonably beginning to despair of shooting any game for the day. But "*nil desperandum;*" just as the last ray of hope had vanished into utter darkness, we thought we descried through the dim obscure, something white, which we judged might be within gunshot. Fearing, however, it might be a shirt on a human being, (although the whiteness almost forbade the supposition) we hailed. Receiving no answer, the Doctor fired at it, whereupon it subsided with a pathetic squeak. Paddling to the shore, we found, by aid of a lucifer match, that it was a large spoonbill duck, a species of bird which lives chiefly on fish, and which I had on more than one previous occasion endeavored in vain to eat. The hungry bogas, however, insisted, that with the aid of our mustard, it would, under existing circumstances, be "*magnifico;*" therefore in our despair we took it on board, and went on prowling our way in the dark, running our boat upon logs, and into bushes and mud for some time. At last we heard a response to our signal guns of distress; and guided by this, we let our boat stick on the next mud flat she pitched into; and having secured her to something or other, that we thought would not float away, we waded, up to our knees in mud, in the direction of the voice, which at last brought us to the hut of which we were in search.

A young man with whom we had met in Baudó the day before, had kindly given us a letter of introduction to his mother, who existed here; and as we emerged from the mud on to what appeared to be firm bottom, we saw the old lady herself, under bare poles, holding on high a flambeau for our guidance. She had been roused by the unusual sound of our signal guns. They had, indeed, created quite a sensation in this ob-

scure spot, which, above all others, is entitled to be held as the "uttermost part of the earth." She stood at one of the sideless sides of her habitation, and held the light at the top of the long notched post which served as its entrance-steps. As we clambered up, we endeavored to quiet any apprehensions she may have entertained of hostile invasion, by assuring her that we were peaceful strangers, and moreover bearers of a friendly letter of introduction from her son.

Having made our salaams, we devoted a few minutes to praises of the house, its position, &c., (for which I hope we may be forgiven hereafter;) and then delicately broached the subject of breakfast. This our worthy hostess cheerfully volunteered to prepare, provided we had any thing to prepare it from; at the same time expressing her regret that she had not a mouthful to offer us. Although we were traveling in search of information, this was not exactly the kind we wanted; but to put the best possible face we could on the matter, we ostentatiously paraded our spoonbill. By aid of hot water and garlic, the old lady managed to convert this into something diabolical, a little before midnight. We forced it down, in the dark; and then, hanging up our hammocks to the posts of the hut, were soon pelted to sleep by a drenching rain, accompanied by very loud thunder, and magnificent lightning.

We occupied the next day in making observations on the bay, bar, tides, &c. The result was an entire, although most reluctant conviction, that the obstacles here to be encountered, must effectually prevent the Baudó from constituting a portion of an inter-oceanic canal route.

This unfortunate prostration of our hopes was, however, attended by one slightly mitigating reflection, viz. that it absolved us from the obligation of prosecuting further examinations of the partition ridge in search of a low pass, between the tributary waters of the two oceans.

My sole reliance for a canal, even of the limited dimensions of that of which I was in search, was now centered in the facilities that might be presented for that purpose by the upper portions of the Atrato above Quibdó, in connexion with the San Juan below San Pablo.

At the same time, I entirely abandoned, as sheer nonsense, my last lingering aspirations for a ship canal.

When, on ascending the Atrato, I found that the sudden deterioration of that stream above Vigia Cubarador, (produced by the abstraction of much of its water through Caño Tadia,) forbade all hopes of navigating by ships beyond that point, I at once struck out a new route for myself. This will be found laid down on the map (Plate XII, vol. XXVII,) extending from the Vigia to the Bay of Cupica; and was intended to be fed from the Atrato.

Misled by the falsehoods communicated to Humboldt, and since that time received as truth by all interested in an inter-oceanic communication, I had hoped that perhaps an almost unbroken plain did *really* exist in that latitude, stretching from the Atrato to the Pacific. But after having found a partition ridge of more than 500 feet in height at the head of the Pato; and learning from the patron of our ranchada, that the same ridge was still higher at the head of the Okimunguido; and from those who had frequently crossed it, at the head of the Napipi, that it attained a for-

midable elevation at that point, I relinquished all ideas of its practicability.*

Nature had kindly permitted some half dozen cocoa-nut trees to grow near our hut; and by means of this fruit, and some fine fish which by good luck were caught just in time for us, our hostess managed, by preternatural exertions, to have breakfast ready by 3 o'clock in the afternoon. This night, also, was cloudy, but as there was no rain until towards morning, the Doctor and I watched until long after midnight, hoping that the clouds would break away, and allow us to observe the latitude; but in vain. Thus we have been baffled in this object every night (nine in all) since we left Quibdó. It is not to be inferred, however, that the season was especially wet; on the contrary, it presented but a fair average of the weather for the whole year, for in this region the occurrence of twenty-four consecutive dry hours is something of a rarity; and two or three dry days in succession, are phenomena but seldom witnessed.

Next morning, we started back for Baudó, inasmuch as I had determined to ascend the Pepé, and by that route to reach Quibdó a second time.

We left without a mouthful of provisions, and with a tolerably good prospect of another day's fasting.

A few small tree-ferns to-day, near the mouth of the river, were the first we had yet seen; and in many spots we saw tall bamboos. Vegetation is every where dense, to the water's edge.

For fourteen miles, or about eight hours, we did not pass a single hut. The ground is too swampy, and liable to overflow, to induce their erection, or any attempt at cultivation.

We saw a few flocks of teal and ducks. Luckily, I shot a fine duck during the morning; and towards evening, at a negro hut, we expostulated half a dozen eggs from a dirty old hag, (I beg her pardon, "dark eyed Señora" is the term.) Soon after, we reached another hut, where we stopped for the night; and where, by an excess of good fortune, we procured a few plantains, two or three yards of sugar-cane, and a little mata-burro. Upon these and our duck, we breakfasted at nine in the evening; and if the merits of a breakfast are to be estimated by the gusto with which it is eaten, this was a capital one.

We retired in the midst of rain No. 10.

About noon, next day, we reached Baudó; not without feeling a little shabby at the reflection, that, although we should be very glad to see Mr. Posso again, Mr. Posso could not, by any possibility, be very glad to see us. Under this conviction, the Doctor and myself would have preferred, even at the risk of starvation, merely to pay him a ceremonious farewell call for a few minutes, and then push on up the Pepé; but the bogas, who had evidently made up their minds to spend the remainder of the day here, discarded all such excess of refinement, and strenuously opposed the proposition. They hoped that another effort to procure sup-

* A rude estimate, since made, of its cost, based upon the supposition that the ground to be traversed would not be more difficult than that in the latitude of the Pató, amounts to full $325,000,000.

A friend in London recently sent me a prospectus for the formation of a Company to construct a ship canal by the Atrato and Napipi route, at an estimated expense of $15,000,000, or less than one-twentieth of my estimate!!

plies might be more successful than their former ones; and in addition, pleaded excessive fatigue, and a wish to stop some of the leaks in the boat. Our sentiments of delicacy yielded to their piteous arguments, and we decided once more to quarter ourselves upon Señor Posso for the remainder of the day.

It had happened, most fortunately for us, that we had previously stopped at a hut a few miles below Baudó, to inquire for something to eat. Neither love nor money, however, could extort any thing in that line; but Dr. Halsted, finding a very sick child in the hut, gave its mother his professional advice regarding it, adding some appropriate medicine, which he happened to have in his trunk. Now, a real live "Medico" is here considered the greatest man in all creation, except, perhaps, the Cura; and I never failed to prefix a very emphatic "Doctor" whenever I addressed Dr. Halsted in presence of the natives. His gratuitous services on this occasion proved more availing than our exhibition of money, although backed by the enticing display of some half dozen empty claret bottles; for the mother forced upon him a bunch of plantains in grateful acknowledgment of his kindness. Our ability to contribute this addition to the common stock, served in some measure to mitigate our grief, as we again crossed Señor Posso's threshold. We received, however, that cordial welcome which only those who have "roughed it" themselves, know how to extend to others.

On the morrow, at daybreak, we took leave, and commenced our ascent of the Pepé; without having been able, in the meantime, to procure anything eatable for the voyage.

At four miles from the Baudó, the Pepé is full 100 feet wide, with a centre depth of from 14 to 18 feet; which at times becomes reduced to 6 or 10 feet.

At thirteen miles from its mouth, it receives the Sandó, coming from the South. At the junction, this branch is about as wide as the Pepé. It is sometimes traveled by canoes to near its sources, beyond which is a pathway, crossing a ridge which divides its waters from those of the Dipurdú, a branch of the San Juan. (See Plate XII., vol. XXVII.)

From the Baudó to the Sandó, the average width of the Pepé is 100 feet. At 15 miles, the width becomes reduced to about 80 feet; the center depth 10 feet for a width of four or five yards only; and but five or six feet for two-thirds of the entire width.

At sixteen miles up, we first saw semi-rock at the water's edge. It was the indurated gray clay, containing a little very fine sand, and comminuted fragments of shells. It afterwards occurs at four miles above, and then at many points along the stream. At the first point, its strata dipped eastwardly, at an angle of about forty-five degrees. On this rock lie the diluvial grey and yellow clays; the latter over the former.

Up to this point, the banks consist almost entirely of mud, frequently overflowed; and backed by swamps, as in the other streams. Beyond here, however, the clay banks begin to show themselves frequently, and at a greater height than below, being now from three to six feet above the present surface of the water, which is rather above the ordinary stage. Beds of leaves are interlaid between those of the mud and clay. Here, too, fine sand begins to take the place of the mud bottom, which now soon

gives way to coarse sand and silicious gravel. The stream also begins to be much obstructed by old logs and trees, which occasionally gave us a good deal of trouble.

At 20 and 21 miles above the mouth, we passed two low ranges of hills, (see Map, Plate XII., vol. xxvii.,) abutting on the south bank; and at 22 and 23 miles, two others, abutting on the north bank. They all trended somewhat west of north; and did not appear to exceed about 100 feet in the highest points.

By four o'clock in the afternoon, having gone 22 miles, we drew up at an Indian hut for the remainder of the day. (Plate III.)

The Pepé is here still about 80 feet wide. Its greatest depth at the time was four or five feet; but it frequently falls so low as barely to allow free passage to a large ranchada; while occasionally in floods it rises ten or twelve feet higher, overflowing its highest banks, and inundating the swamps back of them. The current was 1½ miles per hour.

We had shot a couple of fine so-called wild turkeys during the afternoon, and having fasted all day, we readily accepted the offer of our Indian hostess to cook them for us. We found here a small patch of plantain trees and sugar cane, and so fared sumptuously. Our hostess was evidently a good housekeeper, for everything about the primitive establishment was scrupulously clean. The whole family presented an air of cheerfulness and good nature, that was quite exhilarating. The afternoon was a lovely one; a pleasant breeze played through the hut; and every thing tended to inspire such a sense of independence, and perfect abandonment of care, that as we lolled in our hammocks, smoking listlessly, until breakfast should be ready, we felt as if we should like to be Pepé Indians ourselves.

One of our bogas was troubled with tooth-ache, and our host offered to extract it for him, assuring him that from long practice he was quite expert in the dentistry line. His implements, although decidedly primitive, were very effective. They consisted of a stick of hard wood, pointed at one end, and a round pebble of some four or five pounds weight. The boga, however, declined his services.

The lady of the house was a good deal puzzled what to do with the plates, knives and forks, &c., with which we furnished her for preparing our lowly table on the floor. She had never meddled with such outlandish contrivances before, and was much amused at watching us use them.

It rained hard early in the evening, and at intervals during the night.

When about starting next day, we asked our friend how many hours it would require to reach the head of the Pepé. He did not understand this, and our patron explained that he did not know what an hour was. We then asked how many leagues we had to go, but this troubled him quite as much, for neither did he know what a league was. But on inquiring *when* we should get there, he replied, "about quarter way between mid-day and sunset.

We gave him some segars and several bright silver dimes in return for his hospitality. The first were highly prized; but he handed the latter to his little children, who at once signified their determination to convert them into a necklace for their pet pup.

About a mile and a half above the hut, or nearly 24 miles from the

Baudó, we passed the branch Beniguadó, which supplies about half the water of the Pepé. Like the Sandó it runs towards the San Juan, and heads (so our men said) near that stream.

Beyond this point the Pepé deteriorates rapidly as a boating stream, alternately contracting and expanding, and becoming extremely circuitous. Some of the bends are so sharp as to trouble a long ranchada to pass them. The passage is also much obstructed by logs, and overhanging trees.

A few miles above the Beniguadó we found other ranges of hills, as shown on my map; these were higher than those seen yesterday, rising in places to full 200 feet. Their general direction was the same, viz. nearly north and south, or a little west of north.

About 11 miles above the hut, or 33 miles from the Baudó, we reached, at 1 o'clock, P. M., the point at which the Atravesía, or path across the dividing ridge, commences.

Here the Pepé varies in width from 20 to 40 feet, and we generally managed to pick out a boat channel of about 2 feet in depth. It is frequently, however, reduced to a mere gutter with a few inches of water. For some miles back, the banks were sometimes bluffs of from 20 to 50 feet high; but generally they ranged between but 6 and 10 feet above the very bed of the stream. The ground on which stands the rancho at the Atravesía, is 12 feet above the present water, but is covered at times by floods. The current at our place of disembarkation was about $1\frac{1}{4}$ miles per hour.

We did not see a single monkey on the Pepé. Birds also were very rare; but among them were two or three Eagles of moderate size; and a few Toucans.

The rancho at which we stopped was quite a large one, with three or four good sized rooms; and, inasmuch as the proprietor was a negro, the sides of the building, as well as the partitions, were closed. We saw no attempt at subdivision into apartments in any Indian habitation; but in those of the negroes, the practice appeared to be general. The latter usually aim also at the possession of certain rudely made articles of furniture, such as tables, boxes for clothes, &c., to which the Indians seemed entirely indifferent.

The gravel of the upper portions of the Pepé was silicious; some of the pebbles were as large as a man's fist, but none larger; neither did we see throughout the stream, any boulders, or the appearance of perfectly formed solid rock. Nor, up to this point, did the Pepé exhibit any of the wildness of the sources of the Pató, the scenery being very tame throughout.

We had kept a look-out for the India-rubber tree, but did not see one. The vegetation generally resembled that along the other streams, including a few bamboos.

As we had the whole afternoon before us, and found that we could not procure a boat on the other side of the ridge until next day, we devoted a few hours to bathing, and to washing our clothes. Not having anticipated so long a trip when we left Quibdó; and having brought but one change with us, we were obliged to do our own washing on several occasions.

INDIAN HUT ON THE PEE DEE.

P.S. Duval & C.ie Steam Lith. Press Phila.

One of the women of the house having crossed the creek as we were bathing, communicated the fact to the others, and we were honored by visits from all of them in turn. The only chance they should probably enjoy of seeing white human bodies was not to be thrown away, and they remained until their curiosity was fully gratified.

During the evening, several Indians who had been hunting in the vicinity, came to the house to spend the night. They had killed a variety of birds, monkeys, a peccari, &c. Their arms were lances, and bows and arrows. The latter were poisoned, according to the invariable custom here.

A good deal of mystery appears to be involved in the preparation of their poison, and we could not get at the true nature of its ingredients, although we had repeatedly made inquiries on the subject. Our bogas insisted that a small green frog furnished one of the elements; and on the Pató, our patron had pointed out to us one of these animals, assuring us that it was extremely venomous, and cautioning us particularly not to touch it. Doctor Halsted had, however, all along entertained but an indifferent idea of the venom of either the frog, or of the poison itself; and without heeding their cautions, caught the frog, and played with it in his bare hands for some time, to the great horror of the bogas. They sagaciously ascribed his immunity from danger to his being a "Medico," and, consequently, endowed with a charmed life; an assumption that was confirmed by my declining the Doctor's pressing invitation to take the little dear in my own hands. To verify his suspicions of humbug in the poison business, the Doctor had taken the precaution to purchase supplies of it at our various stopping places; and I must admit that his subsequent experiments with it, went far to bring me over to his views. We certainly could kill nothing with it, nor did it even produce sickness in the different animals which we subjected to its operation. Moreover, we observed that all the birds, monkeys, &c., that we had seen killed with the poisoned arrows, had received wounds that would have effectually deprived them of life without any extraneous aid from poison.

Confident that the collection of the Philadelphia Academy of Sciences could not boast the scull of a Pepé peccari, I at once struck a bargain for the one brought in this evening, with a view of adding it to the museum of that Institution. The entire skeleton would have been troublesome to prepare in time, or it also would have been secured. The only proviso exacted in the premises was, that the women should first be allowed to convert the head into soup by boiling it; and as the boiling process was precisely what was needed to prepare it for transportation, I gave my consent. Poor peccari, little did he dream, as on that eventful morn he washed himself in the tributaries of the Atlantic, and lunched at those of the Pacific, that ere another dawn he should figure in the double capacity of soup and science, in the hands of the ruthless Anglo-Saxon. Forgive me, if, O Peccari, peccavi.

Soon after our arrival, two of the bogas started off across the partition ridge, in search for a boat. They succeeded in procuring one at a hut some few miles down the Surúcco, the tributary by which we were to

reach the San Juan; and moved her up stream to within a league of where we were on the opposite slope of the ridge.

NOTE. The following paragraph should have been inserted on page 9, after the 13th line:

Our patron lived on the Okimunguidó, (sometimes abbreviated to Munguidó,) which enters the Atrato a short distance below Quibdó. He informed me that there is a much traveled path leading from the head of that stream, across the ridge of partition, to the Baudó. He was very desirous I should examine that route, until he found that I pronounced the partition ridge at the head of the Pató (in connexion with other considerations) to be an insurmountable obstacle. He reluctantly admitted, that at the head of the Okimunguidó the ridge was much higher and wider than where we crossed it; and consequently, he desisted from his importunities that I should examine it.

A Description of the Sliding Caisson, at Her Majesty's Dock-yard, Keyham, Devon. By MR. W. FAIRBAIRN, M. Inst. C. E.*

The substitution of caissons, for the ordinary lock-gates, and their employment for closing the wide entrances of docks, have been somewhat extensively used, although the objections of occupying a considerable time, in having the water pumped out of them, and it being necessary to float them entirely away from the opening, before a vessel could pass, rendered them applicable only for special localities. The great width of opening required for the passage of ships of war, induced a rather general use of such caissons in the royal dock-yards; and at the new dock-yard at Keyham, where it was considered desirable to have the best accommodation for the newest class of large ships, the great breadth of the mouth and depth of the basin, induced the trial of a new form and arrangement of caisson, which should be of such capacity and dimensions as to resist the pressure of the water, effectually close the entrance, and still be so easy of manipulation as to admit vessels of war passing into the dock at any state of the tide.

The Keyham Docks were commenced in 1844, and they consisted principally of two capacious basins, with several entrances, or locks, from the sea. One of these, it was thought desirable to construct in such a manner, as to have the power of using it, when necessary, for a dry dock: its dimensions were 260 feet long, 80 feet wide, and 43 feet deep. The inner end, next the dock, was closed by a caisson of the ordinary form, and at the outer end, next the channel, the new caisson was tried.

The form of the caisson was that of a rectangular vessel, 82 feet 6 inches long at the top, 68 feet 6 inches long at the bottom, 42 feet high, and 13 feet 6 inches wide. It was built of wrought-iron plates, varying in thickness from $\frac{5}{8}$ths inch at the bottom, to $\frac{3}{8}$ths inch at the top; well supported throughout by an inside frame-work of angle-iron, and gusset pieces, and by two decks of iron and one of timber for the interior arrangements; but which, at the same time, imparted great strength to the structure.

* From Lond. Journal of Arts and Science. June, 1854.

The plates were connected by "butt-joints," with covering plates, attached by double and quadruple rows of rivets; and the bottom and ends were clothed with oak timber which bedded upon the cill, and against the jambs, when the caisson was in its place. The internal arrangements of the caisson were such, that when it was required to withdraw it from across the opening of the lock, by merely opening a valve, a sufficient quantity of water escaped from the upper chambers, to allow the body to rise a few inches from the bottom cill; when, instead of, as in the ordinary system, turning it round and floating it away, it was drawn back, by chains, transversely into a channel or opening in the masonry, at right angles with the lock,—leaving an opening of the clear span: and after the passage of the ship, it was drawn across again, and, by opening another valve, as much water entered as settled it securely on its bed or cill. This operation was stated to have occupied only eighteen minutes, for the passage of a line-of-battle ship; ten minutes for opening and eight minutes for closing. The total weight of the caisson was shown to be 290 tons: it contained 33 tons of iron ballast, and had an internal capacity for 323 tons of water. The mechanical arrangements were minutely described, and the general result appeared to have been very successful; and from the tabular statement of the deflexion of the caisson, under the pressure of various depths of water, the structure appeared amply strong for resisting either the dead pressure, or the concussions of the waves, which frequently beat heavily against the entrance of the docks.—*Proc. Inst. Civ. Eng. May 9th*, 1854.

AMERICAN PATENTS.

List of American Patents which issued from May 30th to June 20th, 1854, (*inclusive*,) *with Exemplifications by* CHARLES M. KELLER, *late Chief Examiner of Patents in the U. S. Patent Office.*

MAY 30.

133. For an *Improvement in Sewing Machines*; Isaac M. Singer, City of New York.

Claim.—"I claim the method, substantially as described, of forming a seam with one thread, by carrying the thread through the cloth or other substance, with the needle, and forming the thread into a loop, and at the next passage of the needle forming another loop, which is drawn through the first or previously formed loop. Also, the employment of lateral pressure, whether by a cam, a lever, or their equivalent, to act against and in combination with the needle, at or near the end of its perforating motion, substantially as described, and to insure the proper position of the needle. Also, in combination with a needle for perforating the substance to be sewed or stitched, and carrying the thread through it, a looping apparatus to form a loop at each perforation of the needle, and consecutively liberating the previously formed loop over the one last formed, to effect the concatenation of the stitches. And, also, the looping apparatus, with a recess, into which the thread is drawn to form a loop, or its equivalent, substantially as specified, in combination with the lever, or its equivalent, for alternately opening the recess to receive the thread to form the loop, and closing it to shut in the last formed loop, and discharging the previously formed loop over the one last formed. Also, giving a positive motion to the spring arm guide through which the thread passes from the tension apparatus to the needle, by combining therewith the two bridles, or their equivalents, and the needle carrier, or some equivalent moving part of the machine, substantially as specified, the carrier

forcing up the said spring arm guide to the limit governed by the fixed bridle, and the movable bridle forcing it down to make the slack. And, finally, the method of feeding the cloth or other substance to the needle, for the progress of the seam, by means of the foot or pad which holds it to the table, substantially as specified, by means of which the cloth or other substance can be turned on the needle as its axis, whilst the needle is in it, and the foot or pad is lifted up preparatory to the feed motion."

134. For an *Improvement in Sewing Machines;* Isaac M. Singer, City of New York.

Claim.—"I claim the method of imparting the feed motion to the feed wheel, by means of the cord connected at one end with the adjustable arm of the rock shaft, and the other with the reaction spring, when this is combined with the friction brake, operating substantially as specified. Also, governing and regulating the tension of the needle thread by means of the wire with its edges or guides, substantially as specified, in combination with the turning wing, by which the coiling or winding of the thread around the wire can be increased or decreased at pleasure. And, finally, in the sewing of leather, causing the needle thread, on its way to the needle, to pass through linseed oil, or its equivalent, mixed with a dryer, substantially as specified."

135. For an *Improvement in Processes for Galvanizing Metals;* Christian B. Miller, Wilmington, Delaware.

Claim.—"I claim the construction and application of the rotary reticulated immersing cylinders or receptacles, and the use thereof, in combination with the melting and drying apparatus and diaphragm tanks, for the purpose of rotary dipping, substantially as described."

136. For an *Improvement in processes for treating Gutta Percha;* John Murphy, City of New York.

Claim.—"I claim incorporating with gutta percha, substantially, the proportion of sulphur, or its equivalent specified, and then subjecting it to such a degree of heat and for such a length of time as to expel therefrom its injurious volatilizable ingredients, preparatory to vulcanizing the gutta percha thus treated, or for using it in the condition that my said process of treatment puts it into."

137. For an *Improvement in Dyeing Processes;* Chas T. Appleton, Roxbury, Mass.; patented in England, 20th August, 1853.

Claim.—"I do not claim dyeing fibrous materials by subjecting them to pressure while they are allowed to lie in bulk within the dyeing liquid, as this has been essayed before, but has failed to be productive of my useful result, on account of the impossibility of obtaining by this means a uniform action of the dye upon the material; but what I do claim is, controlling the pressure of the atmosphere during the process of dyeing, by means of exhaustion, pressure, &c., in combination with the method described, of keeping the folds of the goods separated from each other by keeping the fabric constantly in motion, or by suspending it upon hooks within the vat, as set forth."

138. For an *Improvement in Corn Crushers;* Wm. Beal, Lowell, Massachusetts.

Claim.—"I claim the application and use of the peculiar form of tooth cut in the ribs, both of the cylinder and concave, the front of the tooth being shaped obliquely across the ribs, and every succeeding tooth being oblique in an opposite direction to the preceding one."

139. For an *Improvement in Knitting Machines;* John H. Barsantee, Philada., Penn.

Claim.—"I claim, 1st, The arrangement and combination of the two cylinders with a space between them, and supported and moved substantially in the manner set forth. Also, the ring in which the inside cylinder sits, and by which it is elevated or depressed; said ring being attached to the frame by set screws for that purpose. Also, vibrating the cylinder by means of the adjustable lever interposed between it and the gearing, or the equivalent thereof, substantially in the manner described."

140. For an *Improved Mode of Manufacturing Turbine Wheels;* Charles H. Bigelow, Lawrence, Massachusetts.

Claim.—"I claim, 1st, Attaching the buckets of turbine wheels to their rims or disks, by forming tongues or dove-tails on their upper and lower edges, and then flowing the melted metal used in casting the said rims about them, so that the rims, when cool, shall rigidly hold and embrace the buckets. 2d, Attaching the guide curves or diaphragms of

the turbine to their disk, by casting them in a similar manner in connexion with their disk; and, 3d, Using the guide curves of the turbine to sustain the weight of the disk, and of the water impinging upon the same, by casting the lower part of the iron flume around dove-tails formed on the said guide curves, so as to mortise them together, or by casting the lower part of the iron flume into holes formed in the said guide curves, so as to rivet them together, as described."

141. For an *Improvement in Hot Water Apparatus;* John Brown, City of New York.

Claim.—"I claim the curved return bends, formed with and on the upper part of the end of each pipe, to pass into and connect with the next pipe above, thereby allowing of the pipe being the full size of any flanch or socket that would be needed with a separate elbow, exposing more surface for the size of the apparatus, and preventing air remaining in the apparatus, as described and shown; and the construction and arrangement of the apparatus, for the purposess and substantially as specified."

142. For an *Improvement in Fastening the Disks and Rims of Car Wheels;* Abel Brear, Saugatuck, Connecticut.

Claim.—"The object of my improvement is, to provide for renewing the rim of the wheel, or the part technically known as the 'tread' thereof, and without the removal or waste of the central portion embracing the hub, and a part of the disk connecting the hub with the rim. I do not claim, for confining cast iron wheel rims to disk centres, the use of the bolts radial to the centre of the wheel, nor bolts whose direction is parallel to the axis of the wheel; but I do claim for confining cast iron wheel rims to single or double disk bodies or centres, the use of bolts whose direction is parallel with a plane perpendicular to the axis of the wheel, and whose direction is also in the course of circular arcs, described from the centre of the wheel; the bolts being either conical in form, or encased by conical sheaths, to facilitate such adjustments as shall secure the parts firmly togther, all substantially as set forth."

143. For an *Improvement in Hooks and Eyes;* J. H. Fairchild, Jericho, Vermont.

Claim.—"I do not claim the general device of bending the hook back or inward to prevent the eye from being loosened, but only when the body of the hook is bowed, and the point brought quite down within the bow. What I claim is, the peculiar form and construction of the hook, having its point brought round within the bow, as described, so as to prevent its being unintentionally unhooked, or becoming catched or tangled with clothing, hair, or other substances."

144. For an *Improvement in Vises or Chucks for Holding Cylindrical Bodies;* Charles Gregg, Brooklyn, New York.

"The nature of my invention consists in the formation of the jaws or holding parts of the chuck or vise, the opposite parts being dissimilar, the one for receiving the cylindrical body, the other to keep it in its place and prevent its turning."

Claim.—"I do not claim a cylindrical die or revolving circle, having scores or recesses in its periphery, except when such die is used in combination with another and smaller cylindrical die, having a groove cut in its periphery, parallel or nearly parallel with its axis, which form two sharp edges, that sink into the body to be held when pressed against it by means of the screw and slide, as described."

145. For an *Improved Machine for Cutting out Cloth;* John Harraday, City of N. Y.; patented in England, January 20th, 1854.

Claim.—"I claim, 1st, The employment, for the purpose of cutting several thicknesses of cloth or other fabric or material, of a reciprocating knife, which works through an opening in a table upon which the cloth is placed, and has one side and its edge working in or very nearly in close contact with the sharp edged plate or other sharp edge at one side of the said opening. 2d, The employment of a knife with the back extended in the form of a rod, as set forth. 3d, Making the table which carries the cloth, fabric, or material, with a loose centre piece, which contains an opening to receive the knife, and has its axis in line with the axis of the knife shaft, and is geared with the knife shaft so as to turn therewith, and at all times bear the proper relation thereto, as herein described."

146. For an *Improvement in Cameras for taking Stereoscope or other Daguerreotpes;* Silas A. Holmes, Brooklyn, New York.

Claim.—"I do not claim the mere operation of taking two pictures with two cameras, but I am not aware that two camera boxes have ever been attached together at the for-

ward edge, to be directed on to one object to be taken, by which means the axis of the cameras are directed on to the same object, and the object glasses are always the same distance from the object, which would not be the case if the two cameras were not connected together, the axis of the cameras at the object glasses (or daguerreotype plate) forming an isosceles triangle to the object, as indicated, whether the object be near to or distant from the cameras. Both cameras might be so fitted as to be adjusted in the inclosing, but it is believed to be superfluous. I claim attaching two camera boxes together, at or near their front vertical edges, and adjusting one or both of said cameras on to the object of which a daguerreotype or other view is taken, by means of the pinion and rack, or its equivalent, as described."

147. For an *Improved Stave Machine;* Carmi Hobson, Hannibal, Missouri.

"The nature of my invention consists in the combination of the rim and wheel, both provided with suitable cutters, and concentrically arranged about the same axis, and these in combination with a fixed rest, so that by passing the stave through between the inner periphery of the rim and the outer periphery of the wheel, both running in the same direction, the stave shall be dressed on both sides by a simultaneous operation, and without the use of auxiliary guides, yielding rollers, or other appliances than the said rim, wheel, and rest."

Claim.—"I claim the combination of the cutting rim and wheel, hung in the same vertical plane, with the fixed rest passing between their cutting surfaces, for the purpose of holding and controlling the stave whilst it is being dressed on both sides, substantially as described."

148. For an *Improvement in Hay Elevators;* Thomas T. Jarrett, Horsham, Penna.

Claim.—"I claim setting the catch free when the elevator reaches any desirable height, by connecting the said catch with a weight by a rope whose length is adjusted in proper relation to the height, as described, to make the weight operate on the catch precisely when the elevator reaches such a height."

149. For an *Improvement in Ventilating Window for Railroad Cars;* George Neilson, Boston, Massachusetts.

"I am aware that for the purpose of ventilating railroad carriages inclined or hinged flaps have been used on the sides of the windows or window openings thereof. I am also aware that a curved guard has been made to extend down on one side, and over the top and under the bottom of a window thereof. I am also aware that a window has been made in two sashes, each hinged to one side of the window, so that one may be made to stand inclined to the plane of the other, and to have an opening between them. I do not claim any such means of ventilating. I am also aware that pyramidal windows have been used on the tops of buildings. I am not aware that a ventilator window, to be applied to a railway carriage, has ever been constructed in the form of a frustrum of a pyramid, and provided with a window opening, and a closing window or door, composed in part or entirely of glass or other suitable transparent material. Nor am I aware that a ventilator window so made has had a deflecting rim or flanch applied entirely around its opening, and for the purpose of shedding rain and deflecting currents of air from the inclined surfaces of the window."

Claim.—"I therefore claim the frustro-pyramidal ventilator window, as made to top, bottom, and vertical sides or windows, and with an opening and a closing window, substantially as specified. And the arrangement of the deflector range entirely around the window opening, and in respect to the deflecting sides, as specified, not intending to claim a deflector or guard, as applied to a car window opening, but to limit my claim to its arrangement on four deflecting sides or planes, and entirely around the opening between them, as set forth."

150. For an *Improvement in Neck Yokes;* John R. Pierce, Castile, New York.

Claim.—"I claim placing the attaching rings of neck yokes upon racks passing on each side of a pinion movable upon the main bolt, or any arrangement substantially the same, for admitting of the equal longitudinal movement of the said rings, as set forth."

151. For an *Improvement in Quartz Crushers;* Daniel Poole, Mount Carmel, Illinois.

"The nature of my invention consists in the construction of a peculiarly grooved roller, and in the combination of a pair of said grooved rollers with a series of cylindrical rollers, used in pairs, for the purpose of crushing gold and copper quartz, the rollers being arranged

as described, and the ore fed steadily to the upper pair by means of an endless apron connected with the machine, and driven as set forth."

Claim.—"What I claim is, the arrangement and construction of the machine, substantially as described."

152. For an *Improvement in Knitting Machines;* Elias M. Ray, Providence, R. I.

Claim.—"I claim the combination of the series of radial and horizontal lifter wires and the stationary lifter cam, with the rotating set of needles, the same being made to operate substantially as set forth."

153. For an *Improvement in Sewing Machines;* Martin W. Stevens and Edward G. Kinsley, Stoughton, Massachusetts.

Claim.—"We claim, 1st, when the shuttle and feed motion are arranged within a cylinder upon or around which the work is placed, so arranging and operating the feed motion as to move the work longitudinally to the cylinder, substantially as described, in order that longitudinal seams may be made in articles of circular form. 2d, Attaching the pressure rollers to a collar which fits to a portion of the needle rod guide, or other suitable fixed part of the machine, in such a way, substantially as described, that they may be turned and readily secured to run either longitudinally or transversely to the cylinder or bed upon which the work is placed."

154. For an *Improved Typograph;* Robert S. Thomas, Wilmington, Delaware.

Claim.—"I claim the type holder with its types and corresponding guide holes, or their equivalents, in combination with the pin, the spring inking apparatus, and the revolving cylinder in its sliding frame, constructed and arranged substantially as specified."

155. For an *Improvement in Furnace Grate Bars;* Benjamin C. Vanduzen, Assignor to John Martin and Benjamin C. Vanduzen, Cincinnati, Ohio.

Claim.—"I am aware that grate bars have been provided at their lower edges with projections affording connexion for a steam or feed air pipe, and therefore make no claim to such projections, separately considered; but what I claim is, the form and arrangement, substantially as described, of furnace grate bars and bearing bars, the former being clear of the usual protuberances, for lateral support, and having each one a pivot at its rear end, occupying a socket in the bearing bar, so as while holding the rear ends of the grate bars to their proper places and relative distance, to capacitate them for lateral shifting at their front ends, at the option of the furnace man, without liability to dislodgement, or for removal of a portion without endangering the stability of those which remain, and for other objects, as set forth."

156. For an *Improvement in Self-Acting Nipple Blocks;* Wm. Waley, New London, Assignor to Jonathan Whipple, Jr., Hopedale, Connecticut.

Claim.—"I claim the construction and arrangement of the block, viz: placing the two pulleys and nipper between the check plates, and attaching said check plates by a joint to a standard, the upper part of which is curved or bent, and is placed a short distance below the pulley and nipper, so as to allow sufficient space for the rope to pass between the pulley, nipper, and end, when the two pulleys are in a horizontal line, by which arrangement and construction the block is made self-acting, operating in the manner set forth."

ADDITIONAL IMPROVEMENT.

1. For an *Improvement in Grinding Mills;* Oldin Nicholas, Lowell, Massachusetts; patented Oct. 12, 1852; additional improvement dated May 30, 1854.

Claim.—"I claim, 1st, The shortening of the frontal projection of each tooth in such a manner as to form a notch in their tops. 2d, I claim the corrugated ribs and concave, in combination with the teeth and corrugated cylinder, these teeth having their frontal projections shortened so as to produce or constitute notches on their tops, or with teeth without their frontal projections being shortened or notched on their tops, either or both."

Re-issues for May, 1854.

1. For an *Improvement in Cutting Boots;* Daniel Lynahon, Buffalo, New York; patent dated October 12, 1853; re-issue dated May 9, 1854.

Claim.—"I claim the tongue which gives the vamp a more exact crimped curve, covers the seam from being seen, and secures it from ripping, and keeps the seam permanent by receiving the strain which comes on them when drawing on the boot, which improvement may be applied to any material whatever, of which boots may be made."

2. For an *Improvement in Harvesters;* William H. Seymour and Dayton S. Morgan, Brockport, New York, Assignees of Nelson Platt, formerly of Ottoway, Illinois; patent dated June 12th, 1849; re-issue dated May 23d, 1854.

Claim.—"1st, The combination of a series of removable cutters with the links of an endless revolving chain, which carries them successively into contact with the grain or grass to be cut, substantially as described, whether the cutters be contiguous, or placed at intervals upon the chain. 2d, Making one end of each cutter sharp, in order that by pressing against the adjacent end of the next cutter, straw, grass, or other intervening obstructions may be cut in two, and allowed to pass out, the cutters thus freeing themselves from obstructions, which otherwise might either choke or break them. 3d, Making the cutters narrower at one end than the other, so that as they are carried forward by the chain in a straight line, they may present a series of inclined cutting edges, against which the stalks of grain or grass are pressed by the reel, or the progress of the machine, until severed, by which arrangement of the cutting edges their efficiency is greatly increased. 4th, The employment of a sweep or turning rake, for the purpose of sweeping the grain off the platform in such manner as to deposit it upon the ground with its stalks at right angles, or thereabouts, to the path of the machine. 5th, The method of vibrating a sweep rake, and turning its teeth so as to pass over the grain, and to seize and sweep it off the platform, whether the devices employed to effect these movements be such as described, or others equivalent thereto. 6th, The method of holding a sweep rake firmly, with its teeth at the proper distance above the platform, by a latch, or the equivalent thereof, which, operating with a greater certainty than a weight spring, or other fastening not rigid, more effectually prevents the rake teeth from rising so as to over-ride the grain, and at the same time avoids the necessity of moving a heavy weight, or overcoming the tension of a strong spring in elevating the rake preparatory to its retrograde stroke. 7th, The construction and arrangement of a sweep rake, and the mechanism for operating it in such manner that it is carried back and forth, and raised and lowered, without support at the outer end, thereby rendering it less liable to become entangled with the grain, and clogged or broken. 8th, The method of changing the frequency of the alterations of the rake or other device for discharging the grain by means of the wheels and pinion, or other equivalent devices for producing a differential movement, for the purpose of varying the size of the sheaves, as may be required, substantially as set forth."

Designs for May, 1854.

1. For *Cooking Stove or Summer Range;* John Abendroth, Port Chester, New York; dated May 2, 1854.

Claim.—"Is, to the combination of mouldings and ornaments."

2. For *Frames and Handles of Hair Brushes;* Hugh Rock, Assignor to H. Rock and Francis McLaughlin, Boston, Massachusetts; dated May 2, 1854.

Claim.—"Is, to the ornamental design."

3. For *Cooking Stoves;* N. P. Richardson, Portland, Maine; dated May 2, 1854.

Claim.—"Is, to the general ornamental design of the stove."

4. For *Doors of Gas Ovens or Summer Ranges;* S. W. Gibbs, Albany, New York, Assignor to North, Chase & North, Philadelphia, Penna.; dated May 9, 1854.

Claim.—"Is, to the design, consisting of a carved shield raised on a panel, the panel being surrounded by a moulding."

5. For *Clock Case Fronts;* Chas. Chinnock, City of New York; dated May 16, 1854.
Claim.—"Is, to the design and configuration of the plate."

6. For *Portable Cooking Ranges;* G. Smith, H. Brown, and J. A. Read, Assignors to Abbot & Lawrence, Philadelphia, Pennsylvania; dated May 23, 1854.
Claim.—"Is, to the design of the ornaments in bas-relief on the front and ends of the stove."

7. For *Cast Metal Clock Case Fronts;* Charles Chinnock, City of New York; dated May 23, 1854.
Claim.—"Is, to the design and configuration of the clock case front."

8. For *Fronts of Cast Metal Clock Cases;* Charles Chinnock, City of N. York; dated May 23, 1854.
Claim.—"Is, to the design and configuration of the clock case front."

9. For *Cooking Stoves;* Jacob Beesley and Edward J. Delany, Assignors to Cresson, Stuart & Peterson, Philadelphia, Pennsylvania; dated May 23, 1854.
Claim.—"Is, to the design for golden star cook stoves."

10. For *Parlor Stoves;* Jacob Beesley and Edward J. Delany, Assignors to Cresson, Stuart & Peterson, Philadelphia, Pennsylvania; dated May 23, 1854.
Claim.—"Is, to the design for the gothic queen parlor stove."

11. For *Portable Ranges;* John F. Allen and Joseph Stewart, Assignors to Cresson, Stuart & Peterson, Philadelphia, Pennsylvania; dated May 23, 1854.
Claim.—"Is, to the design for portable range."

12. For an *Oven Door;* John F. Allan and Jos. Stewart, Assignors to Cresson, Stuart & Peterson, Philadelphia, Pennsylvania; dated May 23, 1854.
Claim.—"Is, to the design for the oven door."

JUNE 6.

1. For an *Improvement in Knitting Machines;* Brown S. Wood, Burrillville, R. I.

Claim.—"I claim, 1st, The employment of a series of wide and narrow tongued jacks, arranged in any desired order of succession, to form short loops upon the frame needles, and lay long loops between certain of the said needles, in such a manner that they may be entered and caught by a set of rib needles, working parallel or nearly so with the frame needles, substantially as described. 2d, The method of giving a lead or advanced motion to the narrow jacks by means of the double slur, having one part wider than the other, and the recess made in the heads of the wide jacks, to prevent their being operated upon until the wide part of the slur comes in contact with them, and allow only the narrow jacks to be operated upon by the narrow part, substantially as set forth. 3d, The movements of the two sets of needles relatively to each other, that is to say, the front needles rising first and then remaining stationary to receive the loops upon and between them, the rib needles being in the meantime stationary, but rising after the loops are formed, and entering the loops intended for them, and then both sets of needles descending together to carry the loops through those previously formed. 4th, Arranging the rib needles at such a distance from the front needles, that their upward motion will not carry them through their loops, and springing their ends forward to the requisite position for the purpose by means of a presser, constructed, arranged, and operated substantially as described. 5th, Attaching the head which carries the jacks, the slur, and the thread carrier, to a frame which is capable of swinging back, substantially as described, to expose the needles, and afford greater facility for their adjustment, for the running on of the quarter, and for the repair of any damage to the machine, or to the web."

2. For an *Improvement in Balancing Slide Valves of Steam Engines;* Robert Waddle, England; patented in England, April 27, 1853.

Claim.—"I claim, 1st, The equilibrium table, with its ledges, or their equivalents, applied to and acting in combination with the valve, substantially as described. 2d, The packing pieces extending from the back of the valve chests and abutting against the back of the valve, in combination with the small passages leading to the ports, substantially

in the manner described. 3d, Combining the equilibrium table, or its equivalent, with the packing and small passages, by the joint action of which a slide valve is perfectly and entirely balanced."

3. For an *Improvement in Machines for Washing Bottles;* A. H. Rauch, Bethlehem, Pennsylvania.

Claim.—"I do not claim a folding brush for washing bottles, independent of its peculiar construction, as such brushes have been used before; but what I do claim is, a rectangular shaped folding brush, which has three of its sides made of solid strips, and set with bristles, which serve to cleanse the shoulder, periphery, and bottom of the bottle at the same operation, while its other side is made hollow, and serves as a canal for introducing a constant stream of clean water to the interior of the bottle to facilitate the cleansing operation, and the whole united together by loose joints in such a manner that when the brush is folded, the cross-piece which carries the brush for cleansing the bottom of the bottle will assume position in line and parallel with the hollow stem, while the pieces carrying the side and shoulder brushes assume a vertical position in line with each other, and lie parallely and snugly alongside the stem and bottom brush, substantially as set forth. I do not claim washing bottles in an inverted position; but what I do claim is, the employment of the revolving cone, or its equivalent, which is so arranged and operated that it takes hold on the bottle, which is inverted, and has its mouth resting in a socket, and causes it to revolve rapidly when the machine is in operation, and brings its inner and outer surface in contact with the inside and outside cleansing brushes, substantially as described. 3d, The employment of the stationary inside and outside cleansing brushes, in combination with the revolving cone, and inside and outside branch pipes of the elevated reservoir, the whole being constructed, arranged, and operating in the manner described. 4th, The self-adjusting arrangement for accomplishing the three following objects: 1st, Folding the expanding frame, and retaining it thus, ready for entering the mouth of the bottle. 2d, For elevating the revolving cone so that it may be out of the way when the bottle is being placed over the brush; and, 3d, For shutting off the supply of water while putting another bottle to be washed over the expanding brush. 5th, Arranging a spring between the supply stem and the side strip of the brush frame, for the purpose of expanding the brush as soon as it enters the body of the bottle, as set forth."

4. For *Improvements in Instruments for taking Deep-Sea Soundings;* Chas. F. Brown, Warren, Rhode Island.

Claim.—"I claim an implement constructed and operated substantially as described, for the purpose of sounding the depth of the ocean."

5. For an *Improvement in Brick Pottery Kilns;* Joseph Baron de Palm, now residing in the City of New York; patented in England, July 13, 1852; in France, Aug. 13, 1852; and in Holland and Belgium, September, 15, 1852.

Claim.—"I do not claim secondary or vapor chambers over the main chambers, forming an upper tier, with numerous apertures, through which heat passes from below; but what I claim is, a series of upper and lower chambers in kilns for baking or burning bricks and pottery, communicating with each other by apertures in the partition walls and floors, in combination with adjustable dampers or registers in the apertures in the floors between the upper and lower chambers, as described, for the purpose of regulating and controlling the heat in its ascent, and directing it to those parts of the upper chambers where it may be most required."

6. For an *Improvement in Combination of Railroad Tracks and Wheels;* Henry R. Campbell, Lebanon, New Hampshire.

Claim.—"I do not claim, as a part of my improvement, what is called the 'compound rail,' (or a rail composed of two or more bars in its cross-section,) so joined and fitted together as to form one continuous bar or rail on each side of the track to be used, with wheels of a single tread and a flanch on one edge in the usual form. Nor the invention of two railroad bars laid side by side, so as to be used under a wheel of single tread and flanch on one edge in the common form. Nor a rail with a groove in it, or two rails so arranged as to form a groove between them, to be used merely as a guide to the flanch upon wheels, having a bearing or tread on one side of the flanch only, in the common way. Nor a wheel with a flanch in its centre of tread, which is intended to run and bind in a grooved or double rail; or a grooved wheel, which is intended to bind upon a single rail of any form, or any similar contrivance by extra rails or wheels to create an unusual grip

or friction over what is due to weight, (as ordinarily applied,) on rails of inclined planes, as heretofore claimed or patented. The essential and distinguishing character of my improvement is, the double rail, in combination and use with wheels having a tread or bearing on each side of the flanch, as described. What I claim is, the combination of the wheel with the flanch in the middle of the tread (which shall be symmetrical on both sides of the flanch, as to diameter and tread), with the double line of rails so constructed that the flanch of the wheel shall run freely between said double line of rails, and with sufficient play or space between said double line of rails to avoid unnecessary friction against said flanch, and to accommodate the ordinary inequalities in the width and parallelism of the railroad track; the surfaces of said double line of rails to be level, or nearly so, and the two portions of the tread of the wheel to bear the whole weight of the wheel equally, or nearly so, on the surface of said double rails. The tracks and wheels to be arrranged for use in combination, and for application to railroad purposes, as set forth and described. The purpose and objects claimed for said improvement, as the result of the combination, when applied to railroad purposes, is increased economy in the track, engines, and cars, in power, speed, safety, profit, and usefulness of railroad communication."

7. For an *Improvement in Impressing the Thread upon Screw Blanks;* Sam. McCormick, Dublin, Ireland; patented in England, March 22, 1853.

Claim.—"What I claim is, the forming or impressing of screw threads or ornaments on the plain surface of screw blanks, or other plain shafts of metal, by means of three revolving dies placed triangularly on a suitable frame, and worked by mechanism, as described, or by the mechanical equivalents thereof, so as to produce the results described."

8. For an *Improved Berth Knee Former;* Donald Taylor, East Boston, Massachusetts.

Claim.—"I claim the combination and arrangement of the side rulers or bars, the slotted bars and bar, with the springs, the friction rollers, and set screws, or their equivalents, whereby a person is enabled to adapt the instrument or 'berth knee former' between any two timbers, and to the width for the berth knees, as set forth."

9. For an *Improved Machine for Dressing Polygonal Timber;* Henry Allen, Norwich, Connecticut.

Claim.—"I do not claim the employment of a pattern rail to guide a rotary cutting tool or wheel over a piece of work, as I am aware such has been used in machines for turning oars or other irregular forms; nor do I claim the invention of a tracer, permanently fixed to the frame; but what I do claim is, the improvement whereby the said cutting tool may be adapted to the reduction of a stick of any ordinary diameter, and to a size suitable to the stick, as described, such improvement consisting in combining with the tool frame, the sliding rest operated by the lever, and held in position by it and the perforated size plate, as specified."

10. For an *Improvement in bent Timber for Ship Frames;* William Ballard, City of New York.

Claim.—"What I claim is, cutting the heart out of artificially bent ship timbers at the curve or bend known as the 'naval timber,' and combining therewith an iron plate, curved so as to fit the curve of the timber, by inserting it in the place cut out of the timber, so as to be protected from rusting by the action of the atmosphere or bilge water of the ship, substantially as described."

11. For an *Improvement in Cultivators;* Whitman Price, Goldsborough, N. Carolina.

Claim.—"I claim the construction of the accommodating frame, having uprights and cross-ties or suspension bars, together with the compensating strap or equivalent. Also, the construction of the twisted obliquely curved blades or thinners attached to the radial arms, forming a rotary cotton thinner, and the using the same with the right and left double shank furrow shears, specifically as set forth, and as arranged with the cultivator, as described."

12. For an *Improvement in making Seamless Metal Tubes;* J. Pratt, Taunton, Mass.

Claim.—"What I claim is, extending and finishing seamless metal tubes by moving the mandrel and tube in a horizontal direction, while the rollers, or their equivalent dies surrounding the tube, are rotated, or moving the dies in a horizontal direction, and rotating the mandrel and tube, substantially as set forth."

13. For *Arrangement in Dampers in Rotary Stove;* Wm. W. Hill, Greenport, N. Y.

Claim.—"What I claim is, the combination and arrangement of the dampers with a revolving or rolling oven, as set forth."

14. For an *Improvement in Grain Mills;* Walter Westrup, Wapping, England; patented in England, January 24th, 1850.

Claim.—"What I claim is, the general arrangement and combination of parts described; that is to say, the use of two or more pairs of mill stones, the runner of each pair being mounted on the same vertical shaft, and arranged in such manner that when the meal escapes from the first pair of stones, it may be subjected to a dressing operation for the purpose of separating the already formed flour from the unground meal, leaving the unground meal, when freed from the flour, to pass through the second pair of stones and perfect the grinding operation."

15. For an *Improved Rivet Clamp for Wire Fences;* Matthias P. Coons, Brooklyn, N. Y.

Claim.—"I claim the peculiary constructed rivet clamp, and its application to wire fences, or for equivalent purposes, in the manner and substantially as described."

16. For a *Moth Killer;* W. A. Flanders, Sharon, Vermont.

Claim.—"I do not claim a blow pipe in which the flame of a lamp is urged by a stream of alcoholic vapor, generated by the heat of the lamp itself, as this forms no part of my invention; but what I do claim is, the described moth killer, constructed and operating in the manner substantially as set forth, the lamp being entirely protected from the wind and from being extinguished by the dead millers, and the flame blown through an opening in the side of the lantern, as explained."

17. For an *Improved Machine for Cleaning and Watering Streets;* Ross Deegan, City of New York.

Claim.—"I do not claim the rotary brush or the apron, as such have been used before in machines of this character; neither do I claim, of itself, the revolving fan or blower; but I do claim the method of removing dust from streets by means of a rotary sweeper beneath the machine, combined with a fan revolving at speed in an external chamber, which is connected by passages with the chamber which first receives the dust, and the chamber of deposit, as specified, by which arrangement the dust is driven within the action of the fan by the sweepers, and is by suction drawn to the fan chamber, whence it is driven to the chamber and there deposited, the air in passing out under strong pressure through the finer reticulations in the cover of said chamber."

18. For an *Improvement in Flouring Mills;* Edwin Clark and James M. Clark, Lancaster, Pennsylvania.

Claim.—"What we claim is, 1st, The double conveyor for the fine flour and middlings, constructed substantially as described, to wit: the conveyor for the middlings being attached to a tube inclosing the conveyor for the fine flour, the conveyor for the fine flour terminating in the receptacle, and that for the middlings terminating in a receptacle, and in combination with this double conveyor. We claim the arrangement of the receptacles, elevators, spouts for returning the fine flour and middlings respectively to the bolt and the eye of the mill, as set forth. And, lastly, The arrangement, in series, of spouts with their slide valves, in combination with the separate receptacles and conveyors."

19. For an *Improved Method of Turning Hubs;* Smith Beers, Naugatuck, Connecticut.

Claim.—"I claim the arrangement and the manner of operating a series of revolving cutters, for the purposes and in any manner substantially as set forth."

20. For an *Improved Device for operating Cutter Heads of Planing Machines;* Timothy F. Taft, Worcester, Massachusetts.

Claim.—"What I claim is, hanging the planing cutters to the vibrating arm, or its equivalent, in the manner set forth."

21. For an *Improvement in Vault Covers;* Alfred Brady, City of New York.

Claim.—"What I claim is, the cylindrical lens, having its upper face formed in the manner set forth, in combination with the india rubber or other elastic water proof packing and vault cover, whether made of wood or metal, substantially in form and manner of construction described."

22. For an *Improved Hydrant Cap;* Noah W. Speers, Cincinnati, Ohio.

"The object of my invention is to provide a remedy for the liability that the caps of stop-cock boxes are at present subject to, of being purloined or mislaid."

Claim.—"I claim the formation of the cap or cover of a stop-cock box with catch of width exceeding the play of the cap within the rebate, and with pivots whose distance from their confining flanches exceeds the depth of the rebate, (or devices substantially equivalent,) for the objects described."

23. For an *Improved Mechanism for Operating Pumps;* J. A. Whipple, Boston, Mass.

Claim.—"What I claim is, the combination of the wheel, the cogged segments, and the racks upon the end of the pistons, by which I attain an accelerated motion of the pistons at the same time that the power which actuates them is applied in a vertical line passing through their centre, great friction and wear of the pistons and pump barrel being thereby avoided."

24. For an *Improvement in Road Scrapers;* Samuel H. Dudley, Milton, Connecticut.

Claim.—"I do not claim scrapers, chains, hooks, or either of them as such; but what I do claim is, the combination of the bow or bows with the scraper, for the purpose set forth, and in a manner substantially as described."

25. For an *Improvement in Machines to Print Subscribers' Names, &c., on Newspapers;* Edward P. Day, City of New York.

Claim.—"What I claim is, the type cylinder, having a series of type grooves cut in its periphery and parallel to its axis, and binding screws in the cap or end plate of the cylinder, for adjusting the type in the cylinder grooves, in combination with the table platen and ratchet wheel for holding the paper and printing and rotating the cylinder, as an improvement on Henry Moeser's invention for like purposes, and whereby all the names of a subscription list for one post office, and the address of the post office, may be printed at one operation."

26. For an *Improvement in Whiffle Trees;* Francis M. English, Hopkinsville, Ky.

Claim.—"What I claim is, the arrangement of springs on the ends of swingle trees for holding the traces on the darts, and throwing off the same at the will of the driver, as fully set forth."

27. For an *Improved Lubricator;* Robert M. Wade, Wadesville, Pennsylvania.

Claim.—"What I claim is, the hollow cylinder, in combination with the jacket, constructed and operated as set forth, namely, the two apertures in the cylinder being so situated that while the upper one is admitting oil into the cylinder the lower one is closed to the steam, and when the lower aperture is open to the steam the upper one is closed to the steam and to the oil in the cup."

28. For an *Improvement in Steam Generators;* Alexander B. Latta, Cincinnati, Ohio.

Claim.—"What I claim is, the dividing of the coil or coils, commencing with one, then dividing into two, and then sub-dividing into four, or any other number, as described, or any equivalent device."

29. For an *Improvement in Sofa Bedsteads;* Charles F. Martine, Boston, Mass.

Claim.—"I claim the windlass barrel and its working gears, or their equivalents, and the cords of said windlass barrel, in combination with the seat, the back, and a single spring mattrass, as applied thereto, the whole being applied together and made to operate substantially in the manner specified."

30. For an *Improved Eyelet Machine;* Hymen L. Lipman, Philadelphia, Penn.

Claim.—"I lay no claim to the devices described, when taken separate and uncombined; but what I do claim is, the arrangement in one stock, of the double-acting lever, punch, and fastener, with their spiral springs and counter dies, or anvil block, for the purpose of punching holes for and setting eyelets in one machine, as set forth, and this I claim when said lever actuates both punch and fastener, by allowing one to rise, whilst the other is being forced down, as represented."

31. For an *Improvement in Excavator;* Elijah Phelps, Hendersonville, Illinois.

Claim.—"I do not claim scoops, supported by side wheels, such as have been used before; but what I do claim is, the combination of the wheeled scoop with the castor wheels, operating as set forth."

32. For an *Improvement in Seed Planters;* Wm. B. Johnson, Staunton, Virginia.

Claim.—"I do not claim said grooved semi-cones, or their equivalents, separately and apart from the other devices specified and used in combination therewith by me, as I am aware that their equivalents have been used before by F. Vandonen, and are described in the specification of his seed planter, patented 13th of April, 1852. What I claim is, the method described, of sowing seed broadcast by means of the ascending and descending buckets, grooved semi-cones, or their equivalents, and reciprocating bed or table, constructed, arranged, and operating together, substantially as specified. Also, constructing the seed buckets with an open back, false or close adjustable inner back, for regulating the lifting capacity of the buckets, as set forth."

33. For an *Improved Water Level Indicator for Steam Boilers;* Pat. Clarke, Rahway, New Jersey,

Claim.—"What I claim is, the arrangement of the tube in relation to the chamber, in connexion with the boiler, whereby, through the action of the steam and water in the chamber upon the steam in the tube, the water in the tube is made an indicator of the height of the water in the boiler, or made to operate a valve in the feed water pipe, substantially as described."

34. For an *Improvement in Feathering Paddle Wheels;* Thos. Champion and Samuel Champion, Washington, District of Columbia.

Claim.—"What we claim is, 1st, The bowing or arching of one, two, or more of the shanks of the paddles, so that they may pass through the hub and stand in the same transverse line with each other round the wheel with the paddles on each end of each shank, permanently at right angles to each other, whereby the great advantages above mentioned are attained, and the wheel greatly simplified. 2d, Giving the shifting guides a side motion, just sufficient to disengage them from the projections of the paddles from one side of the hub, and simultaneously engage them with projections on the other side of the hub, and vice versa, so as to effect the proper adjustment or shifting of the paddles, and whereby we dispense with the inconvenience of having to turn the frame around to the opposite side of the wheel to shift the guides."

35. For an *Improvement in Seed Planters;* Waitman Davis, near Morgantown, Va.

Claim.—"What I claim is, the operating of the seeding bar of seeding machines, by means of a bell crank and lever, when said lever receives its motion from the leg of the operator in the act of walking, substantially as set forth."

36. For an *Improvement in Apparatus for Filing Mill Saws;* John Sheffield, Pultneyville, New York.

Claim.—"What I claim is, the arrangement of the stirrups, cords, weights, and rollers for holding, guiding, and supporting a file whilst filing a saw in the gate or frame, substantially in the manner represented."

37. For an *Improvement in Gold Amalgamators;* Robert H. Collyer, City of N. York.

Claim.—"What I claim is, the effecting the amalgamation of the gold, or other metal, and the separation of the ores, or other foreign matter, by means of a cylinder or cylinders, fluted to form buckets, or otherwise provided with such buckets, and revolving within a concave trough, or concave troughs, which contain the necessary quantity of mercury, said cylinders operating in the manner substantially described."

38. For an *Improved Lath Machine;* Isaac R. Shank, Buffalo, Virginia.

Claim.—"I claim the revolving gauge formed of two unequal cylindrical segments, in connexion as described, with a reciprocating knife, for the purpose of gauging and insuring the liberation and discharge of the lath."

39. For an *Improved Method of Operating Saw Mill Blocks;* David Russell, Drewersburgh, Indiana.

Claim.—"What I claim is, the combination of the transverse racks, the wheel, and the shafts, with the horizontal connecting piece and its racks, substantially as described."

40. For an *Improved Lathe;* Harrison O. Clark, Worcester, Massachusetts.

Claim.—"I do not claim the sliding rest, or the V shaped knife, or the side cutters, singly, or the bushings, except when used in combination described for the purpose above mentioned. What I claim is, 1st, The knife, in combination with the slide operating in

a straight line to and from the centre, or nearly so. 2d, The movable bushings applied to all the different sized cylinders required."

41. For an *Improvement in Weaving Cut Pile Fabrics;* T. Crossley, Boston, Mass.

Claim.—"What I claim is, the described method of weaving a cut pile fabric, that is to say, interweaving the pile into the body of the cloth by looping it over a shot of filling on the top of the foundation warp, and under a shot of filling under the foundation warp, in the manner described."

42. For *Cleansing Bolts of Flouring Mills;* William Cann, Black Rock, New York.

Claim.—"What I claim is, the application to flouring bolts of a brush or cleaner, as described, which will prevent the bolts of flouring mills from becoming clogged up with and obstructed by 'beards' and other substances which are contained in almost all wheat, and which will keep the bolts clean and free without the necessity of 'shaving' and 'brushing' the bolts, using for that purpose the aforesaid cotton, woolen, or other cloth, or other flexible material, substantially the same, and which will produce the desired effect."

43. For an *Improvement in Grinding Mills;* Edward Harrison, New Haven, Conn.

Claim.—"I am aware that a disk-faced running mill stone has been supplied with a metallic back and eye, when the said runner has been suspended upon a bail, and the grain fed through the eye of the same; and that a small sized running mill stone without a metallic back and eye, has been rigidly secured to its spindle, and therefore I do not claim either of the said arrangements; but what I do claim is, forming the runner of a metallic back and hub combined with a disk grinding face composed of the requisite quantity and quality of stone, and rigidly securing the shaft within the metallic hub of the runner, when the said runner is arranged and operates with the stationary uppermost stone, substantially as set forth."

44. For an *Improvement in Securing Car Wheels upon Axles;* J. L. Mott, City of N. Y.

Claim.—"What I claim is, the method of securing railroad car wheels to their axles by means of a nut, or the equivalent therefor, within the wheel, as set forth."

45. For an *Improvement in Joint Bodied Buggies;* Edwin J. Green, Cedarville, N. Y.

Claim.—"I do not claim a joint bodied buggy with a spring under the seat, as that has been described in the patent of James C. Spencer, of the 27th May, 1851. Nor the invention of a spring reach which shall allow the separation of the front and rear axles to a certain extent, and then act as a tie to prevent their further separation, as the patent of C. H. Guard, of June 10th, 1851, embraces a spring reach which performs this office; nor a spring reach with one point of connexion on the centre of the front axle, and two points of connexion equi-distant from the centre on the rear axle, as this is embraced in the patent of Starr Fairchild, of the 18th January, 1848; but what I do claim is, the combination of a spring reach of the peculiar form and construction, as described, with a joint bodied buggy of the form and style of that patented by James C. Spencer, by means of which greater strength is given to the buggy, and an easy and elastic seat given to the driver, with less expense and greater simplicity than has been hitherto used for like purposes."

46. For an *Improvement in Hay Presses;* Levi Dederick, Albany, New York.

Claim.—"What I claim is, traversing the follower parallel by two sets of levers or toggle joints, with one lever of each set extending beyond the joint of connexion, so as to form a lever to operate the joints when they are so arranged that the lever of the lower set or joint may work or vibrate between the fulcrum levers of the upper one, the two levers being connected together by a rod or links, the whole being constructed and operated substantially as described."

47. For an *Improvement in Moulding Hollow Ware;* James J. Johnston, Alleghany, and James V. Cunningham, Pittsburgh, Pennsylvania.

Claim.—"What we claim is, the arrangement of the fallow board, case box, and anchor, operated as set forth."

48. For an *Improvement in Grinding Mills;* John C. Reed, Assignor to C. P. Buckingham and Henry P. Upton, Mount Vernon, Ohio.

Claim.—"What I claim is, 1st, The hollow spindle, in combination with the metallic

cup, through which the grain to be ground is fed, substantially as specified. 2d, The method of balancing and adjusting the bed stone by means of adjustable weights, arranged in radial guides and movable towards and from the centre of the stone, as described."

49. For an *Improvement in Drying Flour;* Hervey Ely, Assignor to Samuel P. Ely, Rochester, New York.

Claim.—"What I claim is, 1st, Closing the cylinder or other conveyors at each end, or causing them to revolve in close boxes, as described. 2d, Applying to the exterior surface of closed cylinders, continued currents of heated air, so regulated as to keep the contents of the cylinders at a given temperature by an arrangement of dampers, and the observation of the thermometer attached, as set forth."

50. For an *Improved Blowing Fan;* Thomas Wallace and Elizabeth Backmeister, Administratrix, of Henry Backmeister, dec'd., Philadelphia, Pennsylvania.

Claim.—"We do not claim any improvement in the outside casing of a fan, nor in the means and apparatus by which rotary motion is produced; but we do claim the cylindrical revolving diaphragm, with one or more openings for the escape of the air by the combined action of centrifugal force and a vacuum, substantially as set forth."

51. For an *Improvement in Cooking Range;* Dennis Donovan, (for himself and as Administrator of Mitchell G. Hallman, deceased,) Assignor to Henry J. White, Philadelphia, Pennsylvania.

Claim.—"What we claim is, the hinged flue cover consisting of the hinged cover, side pieces, flue spaces, top flue, in combination with the valves or dampers. Also, in combination with the hinged cover and the valves, the arrangement of the aperture, for the escape of fumes from cooking. Lastly, the sliding boiler plates, in combination with the hinged cover and valves or dampers."

52. For an *Improvement in Making Car and other Wheel Tires;* Alfred Krupp, Essen, Prussia.

Claim.—"What I claim is, the making the tires for railway car and other wheels, out of solid bars of cast steel, without welding, slotted, opened, expanded, and finished into the desired shape, in the manner described."

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53. For an *Improvement in the Manufacture of Sulphuric Acid;* Dominique Emile Coutaret, Roxbury, Massachusetts; patented in England, December 16, 1852.

Claim.—"What I claim is, the mode of bleaching and purifying (without loss or injurious emanations,) sulphuric acid from the leaden chambers, by means of the movable cover plunging into the liquid sulphuric acid contained in the boiler, and receiving by the tube the sulphurous gas of the furnace, leaving the surplus to escape by the tube, which arrangement constitutes a new and complete apparatus, whereby is obtained by chemical reaction the bleaching and purification of the sulphuric acid as drawn from the leaden chambers, while it avoids the loss of the nitrous gas, and the before stated inconveniences arising therefrom. Also, the improved mode of concentrating sulphuric acid to sixty-six (66) degrees, without loss or injurious emanations, by means of the movable cover or capital, surrounded by a gutter adapted to the leaden evaporating boiler."

54. For an *Improvement in Threshers;* Wm. Russell Palmer, Elizabeth City, N. C.

Claim.—"What I claim is, 1st, The peculiar form and construction of the furrowed surfaces of the flanches and rubbers, as described. 2d, The combination of such rubbers which are adjustable with such flanches and their arrangement, as described, upon the opposite sides of the flail case, and also the combination of such furrowed rubbers and flanches, substantially in the manner set forth, with the rotating flails."

55. For an *Improvement in Nail Plate Feeders;* Joseph Iler and William Fitzpatrick, Troy, New York.

Claim.—"We do not claim the revolving cylinder through which the nail plates are fed, as that device is not new, and is to be found in several devices for the purpose; among others, it will be found in the patent granted to Caleb Isbister, dated the 31st December, 1844. We claim, 1st, Giving a rising and falling motion to the end of the nipper barrel and nose pieces attached thereto, by means of the cam, bearing, and guide

saddle, in combination with the nipper barrel, substantially in the manner as described. 2d, Constructing the nose pieces with an opening between them so as to permit the jaws of the nippers passing into this opening for the purpose of feeding the scrap end of the nail plate as close up to the cutter as possible, thereby leaving less scrap iron. 3d, The guide and spring, in combination with the nose pieces, for the purpose of guiding and holding the nail plate in the nose pieces, as described."

56. For an *Improvement in Bed Bottoms;* Tyler Howe, Cambridgeport, Massachusetts.

Claim.—"What I claim is, the combining the main springs together and with the frame in lateral directions by means of wire and clasps, in combination with connecting said springs at their ends in such frame by means of rocker blinds, all substantially as specified, and for the purpose of forming a mattrass foundation of bar springs, whose parts shall readily accommodate themselves to the various strains induced by a person's body when laid upon them, and this without injurious strain upon one another."

57. For an *Improvement in Operating Cut-off Valves for Steam Engines;* Thomas Ashcroft, Dorchester, Massachusetts.

Claim.—"What I claim is, controlling the operation of the cut-off plates or valves, by means of two inclined planes, one attached to each valve and the movable stop bar, the whole being constructed as described."

58. For an *Improvement in Cast Iron Car Wheels;* David Prew, Taunton, Mass.

Claim.—"What I claim is, my improved cast metal chilled rim wheel, as made of the combination of a solid or tubular hub, a chilled rim, two undulating plates uniting the hub and rim, a series of ogee or curved arms, (placed between the hub and rim and two plates, and made to connect the hub and rim, and be joined throughout their entire length to the two plates,) and a series of openings in one of the plates, and respectively between the arms, all cast or founded in one piece of metal."

59. For an *Improvement in Spark Arresters;* Casimir Abos, New Brunswick, N. J.

Claim.—"What I claim is, the combination and arrangement of the draft pipe, central spark conducting or return pipe, hinged self-closing valve and stack, substantially as described."

60. For an *Improvement in Insulating Telegraph Wires;* John M. Batchelder, Cambridge, Massachusetts.

Claim.—"What I claim is, the combination of an electric telegraph wire or conductor, with a composition of india rubber and sulphur, forming an insulating coating upon and around the wire, this composition being the same for which a patent was granted to Nelson Goodyear, on the 6th day of May, 1851, and herein referred to."

61. For *Improvements in Stills for Distilling Fatty Bodies;* S. Childs, City of N. Y.

Claim.—"I claim, 1st, The use of a stratum of steam within a jacket or case between a fire heat and a vessel containing any article, such as those named above, under treatment, whereby the heat applied to said vessel can be any desired amount, and the same can be regulated to any desired point, according to the supply and delivery of the steam, as specified. 2d, Passing the steam from a jacket, as set forth, directly into the still and material under treatment, as specified."

62. For a *Lens Lamp Chimney;* Silas Constant, Brooklyn, New York.

"The nature of my invention consists in constructing that part of a lamp chimney which surrounds the flame in the form of an annular lens, for the purpose of so directing the rays of light from their natural course, as to concentrate and project them in any desired direction."

Claim.—"What I claim is, constructing a lamp chimney with the bulge so thickened as to form an annular lens for refracting the rays of light."

63. For an *Improvement in the Construction of Tanning Apparatus;* Nath'l. Dodge, Orford, New Hampshire.

Claim.—"What I claim is, the combination of the two dashers and sets of notch bars, as applied to the two vertical and movable frames and in the vats, and made to operate essentially in the manner as set forth."

64. For an *Improvement in the Construction of Accordeons;* A. Faas, Philadelphia, Pennsylvania.

Claim.—"What I claim is, combining with the diatonic scale of the large keys two

other scales, viz: one for producing all the intermediate notes or semi-tones, and the other founded upon the subdominant of said diatonic scale, and both arranged so as to be fingered by a single set of small keys, for the purpose of enabling the instrument to produce full and correct harmony in any key. Also, providing the accordeon with a sound-board, for the purpose of producing more strength, fullness, and resonance of tone with the instrument."

65. For an *Improved Carriage Axle;* Eli H. Green, Baltimore, Maryland.

Claim.—"I do not claim the mere axle with a shifting sleeve; but what I do claim is, the construction of axles for carriages, wherein the arms and intermediate bar shall be of wrought iron, and the arms thereof formed of eight or more sides fitting into a corresponding hollow of a cast sleeve, the surface of which may be turned for a bearing, in the manner described. Also, the combination of the cast sleeve carrying the huster with the mail coach patent box, for the purpose of obviating the necessity of cutting the axle to remove the broad washer."

66. For an *Improved Printing Press;* George P. Gordon, City of New York.

Claim.—"What I claim is, 1st, The employment or use of a rotating reciprocating fly, arranged substantially as shown, for the purpose of relieving or removing and piling the sheet after it is printed. 2d, Giving, with one inking cylinder, two distributions to the inking rollers for each impression, viz: one prior to the passing of the form, and one prior to the repassing of the form. 3d, The combination of the spiral spring connecting rod and crank motion with the stops for operating a bed or carriages during the time the impression is made, the above parts being arranged as shown."

67. For an *Improvement in Tail Boards of Wagons;* F. M. Harris, Carroll, Ohio.

Claim.—"What I claim is, the manner of rendering the tail-gate or board capable of increasing the length of the body of the wagon when lowered to a horizontal position. I also claim the combination of the spring catches, eye-strap, hinged tail-board, elbow shaped pieces, and hooks, for the purpose of rendering the tail-gate self-locking, and also capable of resting in a horizontal position while unloading."

68. For an *Improvement in Bed Bottoms;* Berryman R. Hundley Lynchburgh, Ohio.

Claim.—"I claim the ring provided with hooks or other attachments for the cords, in connexion with a handle and catch, substantially as described, for the tension of a radial arrangement of the bed cord."

69. For *Improved Vises;* Bernard Hughes, Rochester, New York.

Claim.—"What I claim is, the method of attaching and using the nut or female screw at the back of the movable jaw, with simple screws through its flanch."

70. For an *Improvement in Saddle Trees;* William E. Jones, U. S. Army.

Claim.—"What I claim is, the introduction of a hinge into the pommel, and one into the cantle, in connexion with screws, by means of which the saddle can be made to enlarge and contract, and thus to fit any horse."

71. For an *Improvement in Winnowing Machines;* J. Keech and S. Stillwell, Waterloo, New York.

Claim.—"What we claim is, the movable trunk, for the purpose of converting the open horizontal blast of the ordinary winnowing machine into a vertical blast separator."

72. For an *Improvement in Making Card Teeth;* Wm. Montgomery, Roxbury, Mass.

Claim.—"I do not claim to make card teeth of wire; but I do claim the making of each two teeth and the base thereof, of a metallic plate formed and bent in the manner described."

73. For an *Improvement in Exhaust Fans;* J. V. Merrick, Philadelphia, Penna.

Claim.—"I do not claim the use of suction blowers for increasing draft in a chimney, as this has been long known, but claim the combined arrangements of the valves, L, M, N, O, and the external exhaust blower, E, E, operating in the manner described."

74. For an *Improvement in Printers' Friskets;* Andrew Overend, Philadelphia, Pa.

Claim.—"What I claim is, the construction of movable barred frisket frames by the combination of elastic bars, clamps, and toothed frisket frame, arranged as described."

75. For an *Improvement in Operating Valves of Steam Pumps;* Charles A. Wilson, Newport, Kentucky.

Claim.—"What I claim is, the double weighted lever, having one fixed and one jointed weight, as described, for opening and closing the valve instantaneously, without a rebound at the end of each stroke of the piston. Also, connecting the slotted rod, or its equivalent, with the valve, by means of the weighted lever and the jogs on the valve, to allow the valve to remain stationary until the piston is at the point of finishing its stroke, and then instantly opening and closing them by the weighted lever, the lever turning freely on its fulcrum, causing no motion of the valve thereby."

76. For an *Improvement in Coupling;* Martin Newman, 2d, and N. C. Whitcomb, Lanesboro', Pa., and G. C. Cole, Hartford, Connecticut.

Claim.—"What we claim is, the application of the spring button, operated in the manner set forth."

77. For an *Improvement in Mills;* David L. Latourelle, St. Louis, Missouri.

Claim.—"What I claim is, the combination of the revolving wheel, with a roll or rolls, or with a block or blocks, or their equivalents, arranged in any of the ways or for any of the purposes set forth."

78. For an *Improvement in Harvester Cutters;* Bronson Murray, Farm Ridge, Assignor (through T. R. Spencer, Geneva, N. Y.,) to John S. Wright, Chicago, Ill.

Claim.—"I do not claim any particular form for the irregular or angular shaped back, or any particular for the front cutting edge of the sickle; but I claim making the rear curvatures of the sickle blade, sickle-edged, except the rear projecting points, which latter construction I disclaim, as being the invention of Henry Green."

79. For an *Improved Mode of Closing Wickets in Canal Gates;* David N. Knownover, Danville, Assignor to Richard L. Knownover, Milton, Pennsylvania.

Claim.—"What I claim is, attaching an arm with roller to wicket rods of canal lock gates, by which means the wicket will close when the gate is opened, as specified."

80. For an *Instrument for Trimming Welts of Boots, Shoes, &c.;* Lyman Clark, Assignor to L. Clark and Joseph Sawyer, South Royalton, Massachusetts.

Claim.—"What I claim is, the welt knife, constructed in the manner set forth."

81. For an *Improvement in Adjustable Rails for Replacing Cars on the Track;* Chas. Perley, City of New York.

Claim.—"I claim connecting an inclined grooved rail to a shoe or box setting on the railroad track by means of a joint, or to an intermediate section or sections, so that said grooved incline can be turned to any position to coincide with the flanch of the wheel and replace the same on the track."

82. For an *Improvement in Chain Cable Stoppers;* Charles Perley, City of N. York.

Claim.—"I claim the method of hinging and sustaining one or more pawls on an inclined hinge or hinges attached to the chock, to clamp or stop a chain cable between said pawl or pawls, and the chock or plate on the deck, in the manner specified."

83. For an *Improvement in Crushing and Grinding Quartz and Minerals;* Samuel Perkes, Walbrook, England; patented in England, 12th October, 1852.

Claim.—"I do not claim any of the parts, when separately considered; but the combination of the vessel, the trough, the conical crushing rollers, the hollow axis, and the arrangement for supplying water, as described."

84. For an *Improvement in Railroad Car Odometers;* M. F. Potter, Charlemont, Mass.

Claim.—"I do not claim transferring the motion of the axle by means of the endless screw; but I do claim the arrangement by which the pinion upon the upright shaft attached to the car, is adapted directly to the axle itself, so that while the rotation of said axle causes a revolution of the pinion through the endless screw, the endwise movement of the axle in turning curves, acts upon the pinion so as to move it independently of the rotation of the screw, in the same or opposite direction, according to the course of the curve, the screw exceeding in length the arc of the circle through which the axle would move."

85. For an *Improvement in Bridle Bits;* Ebenezer N. Price, Salem, Massachusetts.

Claim.—"What I claim is, the improvement of making the bit, or providing it with the nippers or jaws, made to operate against the jaw or under lip of a horse, as specified. And in combination with the nippers or jaws, I claim the strap as applied to him, and made to operate with them, not meaning to claim a strap, or its equivalent, separate from the jaws, nor the application of such to the bars of a common bit, but to combining it directly with the nippers, so as not only to keep them from spreading outwards, but to preserve the bit in place, or prevent it from rising too high in the mouth of a horse."

86. For an *Improved Device for holding Pieces in Spoke Machines;* I. Starks, Genoa, and L. Perrigo, Grafton, New York.

Claim.—"What we claim is, the manner of holding and operating the spoke in the carriage, so that upon slackening the tail screw at the one end, the spoke is forced backwards and made capable of being turned without disturbing it from its centres, and is restrained from turning when set, by means of the sliding and turning socket bar in the head stock, provided with a clamp head fitting in a V, or other suitably shaped recess in the head stock, and the socket bar with its clamp head forced backwards by a spring, or its equivalent, whereby great expedition and truth is insured in turning and setting the spoke."

87. For an *Improvement in Carriages;* James L. Rowley, Steuben County, Indiana.

Claim.—"What I claim is, the employment of a spring reach, in combination with the swivel joint on the front end of the same, in the manner set forth."

88. For an *Improvement in Harvesters;* Ira Reynolds, Republic, Ohio.

Claim.—"What I claim is, 1st, The arrangement of a double series of double-edged shear blades, supported at their rear ends by the reciprocating bars to which they are pivoted, and regulated by temper screws, as described. 2d, The grain gatherer, so arranged that its forward portion can be elevated or depressed from the driver's seat without stopping the machine."

89. For an *Improvement in Processes for Hardening Tallow;* C. Schinz, Camden, N. J.

Claim.—"What I claim is, the use of either the nitrate of ammonia alone, or conjointly with sulphite of ammonia, for the purpose of hardening fats used for the manufacture of candles, as described, and which will produce the intended effect."

90. For an *Improved Steering Apparatus;* John Stowell, Charlestown, Mass.

Claim.—"What I claim is, the application of the curved sectoral rack and the rest of the steering mechanism directly to the rudder head, so that such can rise with and be elevated or depressed by such rudder head, in combination with supporting the rack upon the deck by posts formed with shoulders, as described, or by such contrivances as will not only prevent it from moving laterally in a horizontal direction, but permit it to rise upwards with the rudder head."

91. For an *Improvement in Steam Boilers;* Peter Sweeney, Buffalo, New York.

Claim.—"What I claim is, dividing the interior of the boiler by an annular casing filled with non-conducting material, or by a non-conducting tube, formed in any convenient and suitable manner, so as to form an external water space which exposes a thin body of water to the action of the fire, and an inner or central cylinder, in which the water is kept at a comparatively low temperature."

92. For an *Improvement in Buckles;* Wm. Shove, Elizabethport, New Jersey.

Claim.—"I am acquainted with the device of uniting the two ends of a buckle by bringing them together in bosses, which are kept together by a corresponding cavity in the clue of the tongue, and therefore I do not claim the broad device of uniting the two ends of the buckle by a joint, which is kept closed by a peculiar tongue; but I do claim making the union by a common dove-tail joint, which of itself resists tension lengthwise, and which requires only the common tongue to hold it in permanent connexion. The advantage of the above improvement is, that the bow is made equally as strong and durable as the soldered or brazed ones, and with much less expense."

93. For an *Improvement in Locking-up Printers' Forms;* E. H. Sprague, Zanesville, O.

Claim.—"What I claim is, the manner of setting and locking or unlocking the 'form' in the 'chase' by means of the tapering bar, with the intermediate wedges extending lengthwise and crosswise of the 'chase' on the side and end thereof, and operated by

hand lever, as specified, whereby the usual sticks and quoins are dispensed with, and the many other advantages are obtained."

94. For an *Improvement in Tightening Windows;* Thos. Silver, Philadelphia, Pa.

Claim.—"What I claim is, the swell or lateral bearing, in combination with the oblique base, applied in the manner described."

95. For an *Improvement in Operating Bolts and Locks for Controlling Series of Doors;* David J. Stagg, Hoboken, New Jersey.

Claim.—"I claim, in combination with double throw lock bolts, or double acting lock bolts on the doors, as specified, the sliding hasps, constructed and attached to, and operated by the system of bolts, as set forth."

96. For an *Improvement in Spark Arresters;* G. B. Simonds, New Haven, and Abel Breaer, Saugatuck, Connecticut.

Claim.—"What we claim is, 1st, So arranging the conical deflector in the upper part of the case, and in relation to the flanch which is around the draft opening, and extends down inside from the top of the case, that the exhaust steam will be caused to act upon the sparks, and force them into their chamber, and form a screen between the inverted base of said cone and the lower edge of the flanch, and thereby serve most effectually for preventing the sparks rising and escaping through the draft opening when it is desired to retain them in the case. 2d, In the employment of the elliptical shaped cone within the elliptical case, in combination with the spreaders. We also claim regulating the escape of the sparks by means of the adjustable flanch, arranged around the discharge opening."

97. For an *Improvement in Feed Water Apparatus to Steam Boilers;* H. C. Sergeant, Cincinnati, Ohio.

Claim.—"What I claim is, 1st, The combination of the balance valves, the float, and the valve, all arranged within, or applied in any manner to a box, connected as described, with a boiler and a reservoir. 2d, The cup, sunk below the pipe, which supplies the box with water, or otherwise applied inside of the valve for the purpose of receiving and retaining a small quantity of water every time the box is charged, for the purpose of facilitating or expediting the condensation of the steam after the water has been discharged from the box."

98. For an *Improvement in Compositions for Coating Telegraphic Wires, and for other Purposes;* Thomas, Earl of Dundonald, London, England; patented in England, 6th October, 1852.

Claim.—"I do not claim the use of native bitumen or asphaltum for any of the purposes to which it has heretofore been applied; nor any cement made therefrom by mixtures, as heretofore used; nor the covering of textile fabrics with any combination of bitumen or asphaltum; but I do claim the combination of gum shellac, rosin, tar, the unctuous oils, or the viscid oil of coal tar, bitumen, asphaltum, or mineral pitch and india rubber, for the coating and insulating telegraphic wires, and for other purposes."

99. For an *Improvement in Soap Compounds;* T. Chalkley Taylor, Camden, N. Jersey; patented in England, September 17, 1853.

Claim.—"What I claim is, the dissolving of the bran of cereal grains in caustic alkali, and using the product as a substitute for, or as an ingredient in, the manufacture of soap, as described."

100. For an *Improvement in Soap Manufacturing Processes;* T. Chalkley Taylor, Camden, New Jersey.

Claim.—"I am aware that potatoes and other similar bulbous or vegetable materials, divested of their skins, boiled and mashed, or otherwise prepared or manufactured so as to involve a loss of the skin, have been used as ingredients in the manufacture of soap; this I do not claim; but I do claim the process herein described, of treating, by alkali in a cold or tepid state, potatoes with their skins on, in the manner set forth."

101. For an *Improvement in Securing Tools to their Handles;* Anthony Vittaly and Carl Kolb, Newark, New Jersey.

"The nature of our invention consists in securing the tools to the stock by means of a screw metal shoulder, or block and dowel pin."

Claim.—"What we claim is, securing the tool to the stock or handle, by means of the screw rod, block or collar, and dowel pin, constructed and arranged as set forth."

102. For an *Improvement in Looms;* George Yates and Eli Clayton, Lancaster, Pa.

"The nature of our invention is, a grooved shuttle having a groove with edge to slide in a corresponding groove with edge formed on the lathe cap, between the reed and lathe cap, which we style the 'operatives' protector.' We are aware that the patent granted to H. T. Robbins, on the 14th of September, 1852, for an improvement in shuttle guides and looms, which is mainly intended for the same purpose as that aimed at by us."

Claim.—"What we claim is, a mere improvement upon the contrivance of the said Robbins, and which consists in the grooved shuttle, in combination with the grooved lathe cap, as described."

103. For a *Railroad Car Ventilator;* John Bevan, Jersey City, New Jersey.

Claim.—"What I claim is, arranging on either side of a suction fan blower, and on the same shaft with the same, a series of revolving separating blades, or their equivalents, for the purpose of creating a strong revolving current of air above the top of the car, which acts centrifugally upon the cinders, dust, and other heavier particles than air accompanying the current created by the rapid motion of the cars, and causes them to be deflected and fall to the ground, instead of entering the car, while the fan blower acts centripetally upon the air thus separated or stripped of its impurities, until it enters the blower, and then causes it to pass into the car, and ventilate the same agreeably and in a very perfect manner, the whole being constructed, arranged, and operated in the manner described."

104. For an *Improvement in Steam Boilers;* James Wightman, Pittsburgh, Penna.

Claim.—"What I claim is, the arrangement of the arch or roof of the fire-box extending through to the up-take, and connecting with a counter arch, in such manner as to form an elliptical flue to form a communication between the furnace and up-take, in connexion with a series of small return flues above the roof of the fire-box and elliptical flue, and in a curve concentric therewith, so that the upper side of the highest flue will be at the same distance, or thereabouts, below the upper surface of the water within the boiler, whether the latter be upright, as when a vessel on which it it placed is on an even keel; or inclined, as when the vessel is careened, as set forth."

105. For an *Improved Canal Lock Gates;* George W. Wood and Lucius O. Webster, Utica, New York.

Claim.—"What we claim is, 1st. The hooked form of the levers and the curving of the shackle bars, as described. 2d, The adjustable lever box above described, including the mode of adjusting the valve rods and tightening the valve gates by the use of the screws, or their equivalents. 3d, Also, the combination of the hooked levers with the curved shackle bars, and the adjustable lever box, the whole being constructed and arranged in the manner set forth."

106. For an *Endless Chain Horse Power;* G. Westinghouse, Central Bridge, N. York.

Claim.—"The mode of gearing by internal gear and pinion I have adopted is old, and has been long in use; but the peculiar construction of the parts of it, is my invention; therefore, what I claim is, the construction of the gearing, substantially as set forth, having a pinion permanently affixed on the ends of each shaft, to either of which the hubs of either the driving or band wheels fit and are fastened."

107. For an *Improvement in Machinery for Napping Cloth;* Jos. Weight, Lawrence, Massachusetts.

Claim.—"I do not claim the employment or use of cards for napping cloth, irrespective of the peculiar arrangement, for cards have been previously used; but what I claim is, the combination of the endless card sheet and endless transverse card belt, the above parts being arranged and operating in the manner described."

108. For an *Improvement in Machinery for Spinning Wool;* Edmund Victory, Assignor to D. M. Linsley and George Goulding, Watertown, New York.

Claim.—"I do not claim, of themselves, the employment of drawing rollers, revolving with the head, and made, in addition, to rotate at a suitable velocity on their own axes, for the purpose of drawing and twisting the sliver or thread, as such have before been used; but what I do claim is, arranging the drawing rollers to operate in the manner specified, within the revolving tube or head, while the head is sustained by a sufficient bearing on the whole circumference outside of the said rollers, as shown and described,

whereby the double movement of the drawing rollers on their own axes, and with the head, is rendered perfectly steady, and the vibration prevented, which tends to produce an uneven thread."

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109. For an *Improved Veneer Polisher;* Edwin Allen, South Windham, Connecticut.

Claim.—"I do not claim the belts, separately, for belts or their equivalents have been previously used for similar purposes; but I claim the combination of the belt and pressure cylinder, constructed, arranged, and operating in the manner set forth."

110. For an *Improvement in Metallic Grommets;* John Allender, New London, Conn.

Claim.—"I claim making that portion of the tube put through the ring to correspond, or nearly correspond, with the corners of the canvas or cloth, so that when they are bent down upon the canvas they double or bend it over the edge of the ring, and confine it firmly, substantially as described. 2d, Is the scores in the ring, which correspond or nearly correspond with the corners of the cloth and with the points of the tube, in combination with the points of the tube, as described. 3d, Scoring, or otherwise roughening the surface of the rings where they come in contact with the cloth, so as to make them hold the canvas firmer and better. 4th, Making or inserting points in or on one or both of the rings to extend through the canvas into the opposite ring, or otherwise. 5th, Riveting the points of the tube which are bent over on the cloth, or otherwise, substantially as described."

111. For an *Improvement in Quartz Crushers;* D. C. Ambler, City of New York.

Claim.—"I claim, 1st, The combination of a revolving trough with balls located therein, said balls being attached to shafts, substantially as described, and having further imparted to them a pendulous bounding motion, substantially in the manner specified, whereby qnartz or other similar substances may be stamped, crushed, and pulverized in the same machine. 2d, The combination of a revolving trough with balls revolving therein by friction; but this I claim only when these balls are attached to shafts, substantially in the manner specified, whereby quartz, etc., may be pulverized and crushed, as specified."

112. For an *Improvement in the Setting of Steam Boilers;* D. C. Ambler, City of N. Y.

Claim.—"I do not claim the form of boiler described; neither do I limit myslf to the use of a boiler provided with only two heaters, as more might sometimes be advantageous; neither do I claim the method of distributing hot air, nor the protecting of steam surface by means of brick or tiles; but I do claim the method of setting a boiler, as described, in so far as the same consists in grate surface extending the whole length of the boiler, or nearly so, when the same is employed in connexion with a midriff, located substantially as described, and causing the products of combustion to travel in reverse directions. Also, tiles, shaped substantially as described, in connexion with bearers, shaped and located for the purpose of forming a midriff or division between the flues, as specified."

113. For an *Improvement in Processes for Treating Paint;* G. Blondin, City of N. Y.

Claim.—"As I have claimed the composition described, of albuminous paint powder, as a new manufacture, in an application for another patent, I make no claim to it here. What I now claim is, the hardening and fixing of paint, of which albumen is a constituent, by coagulating the albumen after the paint has been spread, substantially as set forth."

114. For an *Improvement in Paint Composition;* Gabriel Blondin, City of N. York.

Claim.—"I claim the composition of ingredients, described for the purpose specified."

115. For a *Method of Governing the Action of Valve Cocks;* Fred'k. H. Bartholomew, City of New York.

Claim.—"I claim the method, substantially as described, of controlling the motion of a valve by means of a variable chamber combined therewith, the said chamber having a small opening, or the equivalent, communicating into it, through which the chamber shall always fill or discharge, whereby the discharge of flow of water shall be governed in the manner described."

116. For *Improvements in Cut Nail Machines;* Thomas H. Barlow, Lexington, Ky.

Claim.—"I claim, in combination with the pairs of fixed stocks and cutters, when said vibrating stocks and cutters are so arranged as to be capable of being operated from one rock shaft, by one cam and lever, and the pairs or sets of stocks constitute the griping jaws for holding the blank whilst it is being headed, and thus dispensing with the usual

mode of griping, substantially as described. Also, in combination with the vertical oscillating nail plate holder, the escapement, or its equivalent, for the purpose of gauging and feeding up the nail to the cutters and gripers, substantially as described. Also, the operating of the nail plate holder from the heading levers, through the medium of the arms, sliding bar, lever, and escapement, or their mechanical equivalents, substantially as described."

117. For a *Flour Sifter and Renovator;* Mark S. Bassett, Wilmington, Delaware.

Claim.—"I claim the arrangement of the radial rollers and horizontal brushes with the coarse and fine sieves, for the purpose of renovating damaged and lumpy flour, in the manner set forth."

118. For an *Improvement in Grain Winnowers;* Joseph Bone, Warrington, Ohio.

Claim.—"I do not claim the mere separation of grain into several grades according to specified gravity by the action of the suction fan, and the arrangement of a single set of tubes, as such is well known; but what I do claim is, the arranging and connecting a series of two or more sets of separating passages, substantially as set forth, so that the grain may be carried through the entire series of separating passages as often as required by the operator, for thoroughly cleaning and separating the same, as specified."

119. For an *Improvement in High Pressure Steam Engines;* Benjamin Crawford, Pittsburgh, Pennsylvania.

Claim.—"I claim the method of producing a vacuum in condensing engines by allowing a part of the exhaust steam to escape into the atmosphere without resistance, by a flap valve, as described, before the condenser is opened, and then condensing the remainder by opening the communication between the cylinder and condenser, whereby the weight, bulk, cost, and expense of working the condensing apparatus are diminished, and the power and efficiency of the engine are increased, substantially as set forth."

120. For an *Improved Machine for Printing Woolen and other Goods;* Thos. Crossley, Boston, Massachusetts; patented in England, April 5th, 1854.

Claim.—"I claim the combination of the series of blocks with the stationary cases, or their equivalents, and the endless chain register, operating in the manner substantially as described, by which any number of colors may be simultaneously applied, and a section of the figure be completed each time the blocks are depressed. 2d, The method of holding and feeding the material to be printed, by means of the endless chain and hooks, by which the material is held rigidly until the operation is completed, and thus a perfect and unerring register is obtained. 3d, The method of giving motion to the blocks, by means of the sector, or its equivalent, whereby they are moved in with a slow motion, and out with a rapid motion, and are caused to remain stationary at the two extremes of their traverse, while they receive their color, and the impression is made."

121. For an *Improvement in Steam Engines;* Benj. F. Day, Philadelphia, Penna.

Claim.—"I lay no claim to the double engine, connected to cranks at right angles on one shaft; nor the principle of using steam expansively, in connexion with a cylinder or engine using it directly from the boiler, as these are described in the patent granted to Daniel Barnum, on the 19th September, 1846: neither do I claim the arrangement of valves as patented to said Barnum; but what I do claim is, in contra-distinction from allowing the steam to pass directly from one cylinder to the other, the taking of the steam from the receiving cylinder to a steam chest provided with valves and ports, by and through which the steam is admitted to, and exhausted from, the expansive cylinder, by which means I retain a longer expansive action of the steam, substantially as described."

122. For an *Improvement in Weaving Double Cloth;* Samuel Fay, Lowell, Mass.

Claim.—"I claim the manufacture of a fabric which has one face of wool, and the other of cotton or linen, substantially as described; that is to say, in no place does the warp, which is upon one side of the cloth, extend into the surface of the other side of the cloth."

123. For an *Improvement in the Construction of Reed Musical Instruments;* F. A. Gleason, Rome, New York.

Claim.—"I claim the hammer, arranged in each vibrating air chamber, in connexion with the wire spring and valve. Also, in combination with it, the vibrating air chambers under each reed, and the modulating air chambers, with the small apertures over the reeds, all arranged and operating as described."

MECHANICS, PHYSICS, AND CHEMISTRY.

For the Journal of the Franklin Institute.

An apparatus for Organic Analysis by Illuminating Gas, and on the use of this Gas in Experimental Laboratories. By CHARLES M. WETHERILL, Ph. D., M. D.

[NOTE. I embrace an opportunity which I certainly would not have created, to say a few words in regard to Professors Alexander and Morfit's remarks in the April number of the Journal, especially as they seem to have misapprehended the nature of my criticism of their apparatus. This criticism was not called forth, because their method is not new; for, interesting as Truth and Justice are to all their lovers, the champions of the rights of others would, in our day, set for himself a task herculean if not quixotic. The motive was simply this; the process which they propose "for organic analysis *generally*," is contrary to the first principles of such analysis. This, however, is so plain to the merest tyro in the "profession," as not to require any remark; but I was desirous of describing Hess' process, which is considered to be a great improvement in organic analysis, and which, as far as I am aware of, has not, until very lately, been set forth in works in our language, to which students have access. Yielding credit to Mr. Hess was incidental to this. The combination of principles applied by Hess in this regard, are, substitution of alcohol for charcoal heat, drying the oxide of copper in the combustion tube, thus avoiding excess in the hydrogen determination, and burning the body in a tray in a current of oxygen, with precautions to insure perfect oxidation, and facilities for determining the ash, when there is any. Now, all of these are described by Professors Alexander and Morfit, with the exception of the use of oxide of copper, which cannot *generally* be omitted, as they will learn by an analysis of sugar, lignin, &c. Reference to my remarks will show that I admitted, that oxide of copper might be omitted sometimes, but *very rarely*. In fact, Dumas and Stas more than thirteen years ago determined the equivalent of carbon by the combustion of natural and artificial graphite and diamond in a current of oxygen, in precisely the manner of Alexander and Morfit. It is to be very much doubted whether a well characterized bituminous coal would yield accurate results by such a method. Reference was made to the position of the stop-cocks not to express an opinion, but to allude to Marchand's very important suggestion for regulating the current of oxygen.

It is customary for chemists, especially those careful of the rights of others, when describing a process involving such rights, to call attention to the fact. Neglect of this is always considered as a claim, the only excuse for which is, ignorance of such rights, and which is not always a thing to be ashamed of. I shall not hesitate to criticise whatever is contrary to the principles of organic chemistry, and incidentally to give credit where it is due. Those who know me will, I am sure, attribute no other motives than for the advance of the science, and the opinions of those who do not know me, are, in this respect, as valueless to me as mine are to them. If proper criticism and discussion are to the advantage of science, a mere war of words and personalities, is as much to its disadvantage as it is disagreeable.]

The application of illuminating gas to the manifold purposes of the laboratory, followed very soon its introduction into the larger cities; its application to Organic Analysis has been described in different chemical journals, of which those that I have seen, are as follows: In *Liebig's Annalen*, lxxiv, 115, Kühn describes, though not in any great detail, an apparatus consisting of a row of from twelve to fifteen four-holed burners, (i. e. such with holes at the corners of a square), each regulated by a stop-cock, by means of which an analysis in a current of oxygen gas by Liebig's method, was accurately performed at an expense of one-twentieth of a thaler, or about three cents and three mills for the gas.

Sonnenschein (Erdman and Marchand, *Journal*, lv, 479,) in an article

on the use of gas in chemical laboratories, describes an organic analysis apparatus by Hess' process, in which the gas is burned with air mixed by the intervention of wire gauze. The gas is admitted by three cocks to a rectangular somewhat pyramidal box of sheet iron, the bottom of which is open, and the top covered with brass wire gauze. Over the gauze are numerous covers, which may be held either open or closed, by springs similar to the portable inkstands in use here. By opening or closing these covers, the gas may be applied to any part of the combustion tube, or gradually from end to end.

Magnus (*Idem*, lx, 32,) describes an apparatus similar to the above, but different in the mode of regulating the issue of gas; which is effected by a tube pierced with a row of small holes upon its upper surface, and running the length of the rectangular box, at a distance below the wire gauze. Small covers with handles projecting below the box are placed upon the holes to prevent the issue of gas where necessary.

Beale's apparatus (*Pharm. Journal*, x, 9,) has a tube pierced with holes at the bottom of the rectangular box, similar to the last described, but with a piston, the drawing out of which enables the holes for the escape of gas to be successively opened. The said box has a movable partition, so that the compartment, where the mixture of gases takes place, can be enlarged gradually from front to back. The gas, mixed with air, burns above two layers of wire gauze, and a chimney admitting air at the bottom, completes the arrangement.

Hoffman, in the appendix of his English edition of *Liebig's Organic Analysis*, describes his apparatus, in which the gases are burned both free, and mixed with air, as follows: The process is that of Hess; the rectangular box covered with wire gauze, in which the air and gas are mixed, runs the whole length of the combustion tube, and is divided into three separate compartments. The first two of these are under the forepart of the combustion tube, and heat it by mixed gases, the remaining box is situated under the platinum tray containing the substance to be analyzed, its wire gauze cover is pierced with two rows of holes through which project very fine tubes, communicating at their other ends with a larger tube to which gas is admitted by a stop-cock, and in which slides a piston, by the drawing out of which gas flames may be lighted successively along the double row of tubes above the wire gauze. Another cock admits gas below the wire gauze, so that at this portion of the tube the heat may be made by free or mixed gas, independently of each other. The mode of heating is evident. The front part of the combustion tube is kept at a red heat by mixed gases, the substance is gradually heated by the small flames by drawing out the piston, and a red heat is obtained at this portion of the tube at the close of the analysis by mixed gases. In all these apparatus, chimneys are used to keep in the heat and regulate the flame. By the different methods by mixed gases, the wire gauze is found to be rapidly oxidized, which was to be expected, since at a red heat it is in contact with gases containing, especially on its under side, an excess of oxygen.

In the commencement of my experiments, I used mixed gases, by means of a rectangular box, about 1½ inches wide at the top, of the length of the combustion tube, and divided by a partition at every second

inch; a separate tube and cock controlled the gas in each of these compartments. This method, however, was abandoned after a few trials, as the heat cannot be regulated with the mixed gases to that degree of delicacy which seems desirable; the quantity of gas entering each box must be a fixed one to obtain the best heat, and depends principally upon the air admitted, so that decreasing the amount of gas gives a flame of a very uncertain nature, and very apt to go out. It appeared to me also, that by this method a larger amount of gas is used than is necessary to give the required heat, which excess of heat communicates itself to the apparatus, and is radiated into the room, to the annoyance of the operator.

This appears also true from theoretical grounds; since by dilution with air, the combustible gaseous particles are in the first place further separated from each other and from the tube to be heated, and consequently a larger volume of gases is necessary to get the required heat where the tube is situated. Secondly, the tube is in the most unfavorable part of the flame for heat; this flame forms a hot-air bath, all parts of which have a certain equal degree of heat, excepting the exterior envelope, which is hotter from excess of air; but this part is the most remote from the analysis tube, which receives less heat from this source, while the exterior of the apparatus receives the most. Flame can be applied to a tube in such a manner as to obviate these disadvantages, as a consideration of its nature will show. Undoubtedly, the hottest part of a flame, as of a candle, is the well known slightly luminous envelope, which, besides receiving the radiated heat of the white hot carbon suspended in the inner flame, is hot from the same carbon perfectly burned with access of the outer air; if such a flame could be opened, so as to expose a greater surface to the air, of course a greater amount of heat would be communicated to a body in contact with it; since, with a sufficient amount of air, no carbon would be deposited upon the body. This can be effected with the flame of a candle, though in a much less perfect manner than with a gas flame, from the different conditions of the two bodies. In a candle, the combustible gas is manufactured by the capillary action of the wick and the heat at its extremity, which causes it to act differently from gas ready formed, and forced from an aperture by a constant pressure. If a body be placed above a gas flame issuing from a small hole without smoke, and at such a distance that no carbon is deposited, it is heated by the radiation of the burning gas, and by the current of hot air ascending therefrom; but the heat from radiation is not the greatest possible, since it is inversely proportional to the square of the distance, and would only be greatest if the combustible body were burning on the surface of the body to be heated; in which case, there would be little, if any, loss from convection. If the body be placed still nearer to the flame, carbon is deposited, which lessens the heat.

I soon observed in my experiments, a mode of burning gas issuing from small holes, which I do not remember to have seen noticed elsewhere, but which fulfils the conditions above mentioned, and which I have applied in my laboratory to other purposes besides heating tubes. It is simply to place the body almost in contact with the hole from which the gas issues; by this means the current of gas dashing against the body to be heated, loses its velocity and spreads over it, forming a thin

coating of gas which burns on its surface with excess of air and without smoking. Dr. C. M. Cresson directed my attention to a mode of using gas for heating and cooking, patented by W. Boggett and George P. Pettit, of England, in which they claim the use of burners with minute apertures from an inverted or inclined surface, so that the upward current of air impinges upon the issuing gas. The burner which was shown to me, and intended for heating a stove, consisted of an inverted truncated cone, the apex being downward, and the side pierced with holes, the diameter at top being about four and a half inches, and at bottom about three and a half inches, and the axis four inches in length. The gas burned with a blue flame, heating the earthenware burner to a low red heat. The heat in such a burner appears to act in a manner similar to what I have above described. The gas streaming into the large reservoir and issuing from so many holes, loses its velocity, and covers the burner with a thin atmosphere of gas, exposing a large surface to the air, and burning in contact with the earthenware reservoir, which it raises to a high temperature. I mention it in this connexion, for the purpose merely of alluding to the principle upon which it proceeds, and may add, that it appears to fulfil well the purpose for which it is intended.

My apparatus is double, since two combustions can be effected as readily as one, and requires only the additional time of weighing the necessary parts of the second analysis. I proceed to describe it as it now stands, premising, that it may be made with less expense than described, as it was originally constructed with a view to experimenting upon the various ways of burning the gas. In its simplest form, I think it can be made cheaper than any I have seen; but I prefer it in its present form, as it will fulfil all the ends to which a charcoal furnace may be applied for heating tubes, and will serve for other purposes besides organic analysis. The analysis may be performed according to any of the processes in use; but that which has been principally experimented upon, is that of Hess. The apparatus may be described in two parts; first, as regards the combustion tube; second, as to its other parts.

First. *The combustion tube:—*

According to Hess' process, the front part of the combustion tube, containing oxide of copper, is to be kept at a red heat, as well as the empty part immediately behind the substance which is being analyzed, while the part containing the tray and organic body is to be very gradually heated, at the same time passing with great circumspection a slow current of air or oxygen; at the close of the operation, it is necessary to raise the tray to a low red heat, for the purpose of completely burning the carbon. The great points to be attained are: 1st, a perfect oxidation; and, 2d, that all the products of combustion shall have a forward and never a retrograde motion. To effect this, requires, (and for some bodies to a greater degree than others,) 1st, a careful and slow addition of heat to the organic substance, and which is capable of being readily regulated; and, 2d, a very careful regulation of the oxygen or air-current. If the heat be at a proper degree, while the oxygen or air-current is too strong, the combustible gases will be hurried over the ignited oxide of copper too rapidly to be completely oxidized, (for in the first stadium of the analysis, the oxidation is effected solely by the

oxide of copper,) and the result will be empyreumatic and acid products condensing in the chloride of calcium tube. If, on the other hand, the gas-current be properly regulated, while the heat under the organic substance escapes beyond bounds, the same effect results, and, in addition, the products of combustion go backwards, and empyreumatic substances condense about the cork in the hind part of the tube, from which they cannot be dislodged, and the analysis is inevitably lost. If condensation has not yet taken place on the hind cork, the analysis can nevertheless not be saved by increasing the air or oxygen-current, to drive the products of combustion forward, as they would be thus carried too rapidly for combustion over the oxide of copper. Where oxygen can be used in this stage of the analysis, there is less danger of failure, since the current behind the substance is sufficiently strong to prevent a retrograde movement, while before, (owing to the conversion of the oxygen into carbonic acid,) the current is sufficiently slow to effect perfect oxidation; some substances, however, afford in the first stages of the combustion, gases explosible with oxygen, in which case an air-current must be used to prevent the backward movement, and which, from its large amount of nitrogen, produces a more rapid movement in the part of the tube where the combustion is going on. This case, therefore, requires the greatest care in regulating the heat and gas-current in the commencement. I have found fats to require the greatest care, for the combustion must be made in an air-current; as they yield explosive mixtures with oxygen, they are both fusible and volatile, which requires a very careful regulation of the temperature in the proper portion of the tube. The addition of a long lever to the key of its stop-cock, as proposed by Marchand, renders a delicate adjustment of the oxygen or air-current easy; and I think the apparatus about to be described, will not fail in effecting all that can be desired, in the regulation of the temperatures. Figure 1* (Plate III,) represents a side view of the burner (for one combustion-tube) and stand. The latter is made of walnut, of the dimensions represented in figs. 1 and 2, and at either end having uprights, upon which slide clamps of the kind represented at A, fig. 3. These clamps have the upper part of their two tines filed into a blunt knife edge; and to fit these, notches corresponding to the position necessary to bring the two rows of burners directly under the combustion-tubes, are filed in the bottoms of the brass tubes, from which the gas enters the stop-cocks. By this means, the burner has a firm seat on the two forks, and either end can be raised independently of the other, or it can be taken away altogether, without disturbing the rest of the apparatus. The stand, as represented, is twenty-six inches in length, but it is divided in the middle, and by means of rectangular rods fixed to one part, and sliding in the other, may be drawn out, and a movable piece be inserted, making it six inches longer. The nature of the burner may be seen from figs. 1, 2, and 3; in 1 and 2, it is represented in the air, a little above the forks, upon the edges of which it naturally rests, as seen in the ground-plan, fig. 3; it consists of two long and two short tubes, brazed together to form a rectangular system, along two sides of which, rows of twelve stop-cocks each, are arranged. The gas enters the system at either end,

* Figs. 1, 2, and 3, are drawn to a scale of one-eighth the natural size.

as indicated by the arrows; but I have found that, for most purposes, with the apparatus of the dimensions indicated, one entrance is sufficient. The keys are placed in an inclined position, (fig. 3,) that the hinder ones may be readily turned by a movable key of sufficient length, which is passed between those of the front row. The rectangular system is cut between the first two of either row of cocks, and united with a union joint, and a brace fixed in the portion indicated in fig. 3, to hold the longer portion of the burner firmly, while the connexions are made. Two pieces of three cocks each, and of dimensions corresponding to the rest of the system, may be by means of unions at their extremities inserted at this place, and the burner made six inches longer, to correspond with the lengthened stand. The stop-cocks are soft-soldered into the system, and the burners proper are soldered, or (preferably, as it admits of more easily removing them), screwed into the upper ends of the cocks. These burners are represented in fig. 1. They are each made of two pieces of brass tubing. The vertical piece, (fig. 1,) fitting in the stop-cock, is of the size sold as one-fourth inch, (outside measure,) and is about three inches in length. The upper piece is three-eighths tubing, which is cut in pieces of two inches, the ends of which must be stopped. This is readily effected by cutting a long screw upon a piece of brass wire of the proper size, and with a couple of turns of the corresponding tap, making a thread at either end of the tube; the screw may be then screwed tightly in the ends with white lead, and cut off close. This effects a perfectly tight joint, and so little of the screw is left in the ends of the tubes, that a moderately long one will close a great many holes. The bit of tube thus closed is either screwed with white lead, or brazed into the vertical one, and on its top two rows of holes are drilled, five in each row, the rows being about one-fourth of an inch apart, and the holes of each row $\frac{7}{16}$ths. The flames issuing from these holes will form a continuous row of forks, as seen in fig. 2, in which figure they are placed farther apart than naturally, for the greater plainness of the drawing. The holes are readily bored with a needle drill worked by a bow. After several experiments upon the best form to give this drill, the following was found to be the most effectual, and with it, if the needle be of good temper, a single one will bore nearly all the holes for the burner. A number eight needle is broken off at a convenient length, (a needle will make two drills,) and without taking out the temper, is made square, slightly tapering at one end, which is quickly done on a grindstone or good hone; the end is then squared, and its opposite angles taken off, as in fig. 4, A; the end thus finished, as seen by its drawing, forms an oblong hexagonal figure, the two long sides of which embrace a space equal to about one-third the area of the original square, and bounded at either end by two angles. If the places for the holes are indicated with a centre-punch and a drop of oil added, this drill cuts with extreme rapidity, and does not easily become dull. It is fastened in a watchmaker's hand vise, which turns freely upon an appropriate handle fixed to it, and is worked with a bow. If by careless handling the drill breaks, another can be made and set in operation in a few minutes. I may mention, to show how readily these holes may be made, that in two hours, besides expe-

Fig. 1.

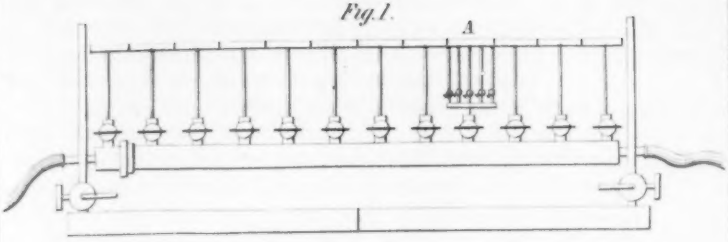


Fig. 3.

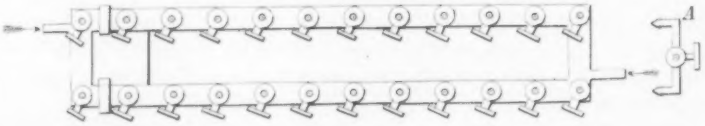


Fig. 2.

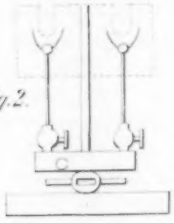


Fig. 4.

Fig. 5.

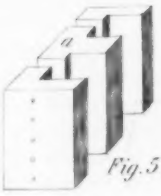
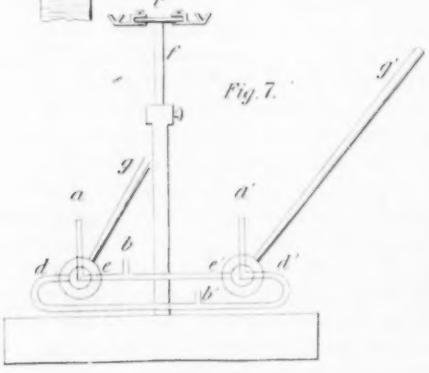


Fig. 6.

Fig. 7.



rimenting at the beginning on the best form of drill, one hundred and sixty-two holes were marked out, punched, and drilled, and for the most part with one drill, which appeared as sharp at the last hole as at the first. Mr. Tilghman, several years since, showed me this mode of drilling fine holes with a needle, in a burner used by him, which will be alluded to in a subsequent part of this article.

Each burner thus finished, gives a double row of flames, ten in all, and which occupy a length of about two inches of the combustion tube; but it is important for the proper regulation of the heat under the organic substance, to have a more extensive control over its advance. This is effected in Hoffman's apparatus by a tube and sliding piston; but it may be more neatly attained, and I think, in the end, as cheaply, in the following manner: The two inch tube from which the flames proceed, is divided into five compartments, which is done by sawing into pieces, cutting screw thread in their ends, and after screwing the long screw in one of these, cutting it off so as to leave a little projecting; another compartment is screwed on to the projecting screw, &c., until they all are united, after which the ends are closed in the same manner; or else the insides of the end of the small pieces into which the tube is cut, are slightly turned away, and little disks are turned off correspondingly and placed between each two, and being clamped together in this fashion, silver solder is melted into the spaces, thus forming five compartments. The tube so divided, is united with another (closed only at the ends), by five smaller tubes, the upper ends of which are brazed into the compartments, and the lower ends connected with the lower tube, each with a small stop-cock. The upper tube has holes drilled into it similarly to the other burners. This compound burner, which represents a gridiron in shape, is placed on one of the large stop-cocks like the other burners, and as represented at A, fig. 1, one such being required for each combustion tube. It is evident that by means of the small cocks, the heat may be advanced in any direction at this part of the apparatus by two flames at a time, and by placing the platinum tray in the combustion tube immediately over the burner, and commencing by lighting the gas at the simple burner on either side, a length of three inches may be controlled by double jets, in the shape of a fork. In special cases, if it be necessary, the two gridiron burners of the apparatus, may be placed side by side, to heat part of a single combustion tube, thus doubling the length so controlled. The small stop-cocks, which would seem to add considerably to the cost of the apparatus, may, nevertheless, be cheaply made of thick brass wire, in the following manner: a drill is made with a conical shoulder of the size required for the plug or key of the stop-cock; this shoulder is ground so as to form cutting edges, and the drill, after hardening, is bored with the shoulder into the end of a suitable rod of steel, the end of which thus bored, is made into the shape of a chisel and hardened. It is plain, that pushing this tool against small bits of wire revolving in a lathe, will rapidly make the plugs of the cocks, which will be of exactly the same size, and will accurately fit the holes bored by the drill into the sides of thick bits of wire, which form the cocks, and which are completed by drilling small holes through the ends of these bits, the plugs being in them. Holes are also bored in the free ends of the

plugs, to enable them to be operated by means of a wire key, bent into an appropriate shape and with a handle. It is not necessary to fasten the plugs, but they should be ground in with flour of emery. These small cocks are $\frac{3}{4}$ of an inch long by $\frac{5}{16}$ diameter at their thickest part, and could be made at an expense of about 12 cents each, and would be found useful in the laboratory for various other purposes than the present. In order to support the combustion tubes and to keep in the heat, a copper jacket is employed, the nature of which will appear from fig. 5, and the dotted lines in fig. 2. It is made of thin sheet copper riveted together, and consists of a middle portion and two ends, one of which is represented in perspective and exaggerated in fig. 5. The middle portion consists of three rectangular pieces, fitting into the three darkly shaded parts of fig. 5, and into the corresponding ones of the other end. All of these parts fit together by insertion like the joints of a stove pipe, and when thus united, the jacket forms a box open at top and bottom, and divided longitudinally by a partition into two portions, forming receptacles for the two combustion tubes. The sides and ends are all double, with air between to confine the heat, and the two notches cut at each end (as in the figures) which receives the combustion tubes, must of course be arranged so that the latter are directly over the rows of flames. At *a*, fig. 5, a tube closed at top is fastened, and inside the cavity of the jacket: there is one at the other extremity, and these slip down upon the uprights of the stand (fig. 1), so as to support the jacket over the burners, as represented in end view in fig. 2. In order to be enabled to lengthen the jacket to suit the rest of the apparatus, when lengthened, there are three additional rectangular middle pieces, by inserting which it may be sufficiently elongated. The jacket has a very stable position, even when at its greatest length, and from the strength given by its form, may be made of very thin metal; the middle partition embraces an inch and an eighth between the two sheets of copper, while the outer walls and ends embrace $\frac{3}{8}$ths. Two semicylindrical trays of sheet iron, occupy appropriate positions in the two compartments of the jacket, and on these the combustion tubes rest upon a layer of calcined magnesia, to prevent adhesion. The burner is brought up to, and almost touching, the bottom of these, and there retained, resting upon the forked clamps A, fig. 3. If the gas be now lighted, it spreads over the bottoms of these iron trays and wraps around the tube, burning with a blue flame. The tubes would be heated more intensely and more completely enveloped by the flame, if the iron tray was not interposed, but experience proved its advantage, for without it the combustion tubes are not only more liable to be so much bent out of shape as to be only available for one or two analyses, but require a much greater care in heating to avoid cracking. Chimneys or jackets are employed to increase the heat and render it more equable, which are made of different lengths, of sheet brass. Two pieces of brass are taken, of equal size and of the requisite length; they are bent as to their length at a right angle, and one of the pieces thus formed is curved semicircularly; at each end of the other plane surface, as well as in the middle of the same, the two pieces are connected by riveting on small slips of sheet brass. It is then bent so as to give the form represented (in section) at *c d d*, fig. 6; *d d* represent additional slips of brass

$\frac{1}{4}$ of an inch wide, which are riveted fast to the four extremities of the chimney and are bent so as to enable it to rest in an appropriate position over the combustion tubes upon the copper jacket. *c* represents one of the riveted slips which hold the two parts of the chimney together. Fig. 6, also represents in section, the arrangement of the different parts of the apparatus in full operation, by which it will be seen how the forked flames from the burner wrap around the tray containing the combustion tube, and are still more reflected upon the tube by the action of the chimney. This appears to act more as a jacket than a chimney, for when made of two semicylindrical pieces, without the portion represented as descending in dotted lines from *c*, the heat appears to be as great. I have also made it with a row of holes for the admission of air in the angles where *d d* join the rest of the chimney; but apparently without any advantage. I have found that a cock with an aperture of $\frac{1}{4}$ of an inch in diameter connecting with one end of the system of burners will furnish more gas than necessary for a double combustion. When the apparatus is lengthened six inches, it is advisable to admit as much gas to the other end, or else have a larger cock for all purposes.

It only remains to consider in this part of the apparatus, the trays in which the organic substance is placed during combustion, and which are made, as usual, of platinum or glass, according to the nature of the substance analyzed. The platinum trays can be readily made by one's self of thin foil, in the following manner, which my friend, Dr. J. Lawrence Smith, suggested to me to try: a bit of steel is turned cylindrically and with hemispherical ends, and of diameter to enter easily the combustion tubes usually employed, and hardened. This is hammered on its side into six different places in a flat piece of lead, each successive cavity being deeper, until the last conceals half the cylinder. The lead mould thus formed is greased, and also the steel, and placing a piece of foil upon the first cavity, the punch is hammered gently upon it until it takes its form; the same is done in the next cavity, and so on to the sixth. After the third cavity, the platinum must be annealed every time. It can then be trimmed off, and forms a very neat tray. To avoid the use of larger combustion tubes when *glass* trays are used, I make the latter of a soda-glass tube, the thinnest that can be obtained. After splitting the tube longitudinally, the ends are drawn off square, and a dish or tray is thus formed, which fits, and is placed in the platinum tray, which prevents the glass from sticking, and is by it protected from the injury of metallic organic salts. Very convenient little platinum dishes for blowpipe purposes may be made as above, using the end instead of the side of the steel punch.

(To be Continued.)

Translated for the Journal of the Franklin Institute.

Specific Heat of Gases. REGNAULT.

M. Regnault read to the Academy of Sciences, (Paris,) a very long Memoir on the Specific Heat of Gases under constant pressure and variable volume, and under constant volume and variable pressure. After

detailing the history of this important question, Mons. R. explained in a brilliant lecture his method of observation, the arrangement of his apparatus, and the important results which he had obtained, results which entirely change the present state of the science, being in complete discordance with the theory of Laplace, and Poisson, and with the observations of MM. Clément Désormes, Gay-Lussac, Welter, and Dulong.

It has been heretofore admitted, that the capacity for heat under constant pressure, is always greater than that under constant volume; and the ratio of these capacities is equal to unity plus a fraction, which in air, is 338 thousandths according to Dulong, 375 according to Gay-Lussac, 421 according to Poisson, &c. By operating in an entirely new mode, and under conditions that he thinks better, M. Regnault seems to have shown, that the difference between these capacities is nothing, or, infinitely small. We shall republish almost entire, M. Regnault's Memoir, and shall cite here, only a few of his experiments and the conclusions which he has deduced.

Conceive two concentric globular vessels, one, whose capacity is a litre filled with gas, (air, for example,) under a pressure of ten atmospheres, the other with a capacity of ten litres. This system of two vessels is immersed in a water bath kept at a constant temperature. If, after having made a vacuum in the second globe, we allow the air to enter it from the first, so that it now occupies a bulk ten times greater, there is neither elevation nor depression of temperature. There will be, however, a depression of the temperature, if at the same time that the air enters the larger globe, a small quantity of the air is allowed to pass out by an orifice in the globe; and the amount of depression of the temperature is constantly proportional to the mass of gas which has escaped into the atmosphere. If the air which escapes is made to do work, as for instance, to move a turbine, re-action wheel, or pump, the cooling increases in proportion to the work done; and we, in consequence, find here, what has been determined in steam engines, in which the useful work done, is more nearly expressed by the heat lost in the fall of temperature, in proportion as the machines are more perfect.

M. Regnault shows clearly, how much his new experiments are opposed to the old hypothesis, which made *caloric* a fluid, at one time in a latent state, at another, disengaged and sensible; he shows, on the other hand, how easily they are explained on the theory which attributes heat to a vibratory motion: the principle of the preservation of moving forces, then, suffices to account for all the transformations of heat into work, and vice versa. After again insisting upon the fact that the theory by which Laplace corrected Newton's formula for the velocity of the propagation of sound in air, and explained the considerable differences between the calculated and observed velocities, is no longer admissible, he expresses an ardent desire to see some new series of experiments on the velocity of sound in air, water, and solid bodies, taking advantage of all the recent progress of science and the mechanic arts.

Cosmos, vol. iv, p. 597.

For the Journal of the Franklin Institute.

On an Improvement in the Manufacture of Iron and Steel. By M. August Laugel: Paris.

Scientific revolutions are always caused by the discovery of some entirely new principle, industrial ones, by a new and happy application of principles long known, but from which all the results have not yet been obtained.

I propose in this brief memoir to demonstrate the possibility of an industrial revolution in the United States with regard to the manufacture of cast-iron, iron, and steel.

A few historical considerations must first be presented. It is universally known, that iron was at first manufactured exclusively by means of charcoal with apparatus of small dimensions. This method precluded the preparation of large quantities, and it became quite insufficient when the introduction of steam-engines gave to industry so much wider a field. The immense importance of coal began to be recognised, and iron was manufactured by its means, according to new methods, which favored its more rapid production in greater quantities.

A rivalry thus commenced between the coal foundries and those kept up by wood, in which the latter were evidently to be overcome. The nations possessing great coal districts, particularly Great Britain, became the producers of iron for all the rest.

In these circumstances, if suddenly there should be discovered a new means of making iron with wood as rapidly and as economically as it is done at present with coal; if besides, the iron thus prepared should offer in quality very great advantages in comparison with that made with coal, is it not natural to suppose, that the consumers who are only attracted by the cheapness of English iron would cease to employ it? Even admitting that under certain circumstances this iron would be dearer, they could more advantageously use it for those purposes for which iron of the first quality is indispensable, such as the manufacture of steel.

The country best situated for the success of this industrial revolution, is, undoubtedly, the United States of America. For example, wood is found there in great quantities, and may, in some places, be obtained at a very low price; on the other hand, the beds of mineral-iron are very numerous: modes of transport, always important in the working of iron, exists in great numbers; here we find all the conditions necessary to success. It remains only to establish with certainty the advantage of this new method of manufacturing iron, and to explain its high importance.

1st. Wood is not charged with those mineral substances, which injure at once the calorific effect, and the quality of the metals fabricated by it. Coal contains often 10 per cent. of matters either useless or injurious. Wood, on the contrary, contains hardly $\frac{1}{2}$ per cent. of mineral substances, which, besides, are never injurious. All wood has great chemical uniformity, while coals differ much from each other, which involves the disagreeable necessity of ranging the methods of employing them. It is well known to metallurgists, that wood should not be employed as a

combustible, without previous preparation, on account of the large proportion of water which it contains.

For many years, the most various experiments have been made to prepare the wood before using it as a combustible. The method to which we would now call attention, has been used for a very short time in Styria and Carinthia, which consists in taking from the wood only the water, and stopping the distillation as soon as the substances which escape begin to contain carbon. Two methods have been used to effect this conversion of wood into *ligneux* (lignum).

1st. The gases coming from the fire-place are brought into immediate contact with the wood; thus the wood is raised to a temperature above 100° Centigrade, which favors still more the vaporization by the tendency the gases themselves have to be saturated with vapor.*

In the second method, only the heat radiating from the gases in the fire-place is employed. These gases are not brought into immediate contact with the wood, but are conducted in pipes of cast or sheet-iron around which the wood is piled.

This second method affords by far the most satisfactory results; being the more economical, and avoiding the disadvantage which sometimes attends the first, of making the *ligneux* pyrophoric, and thereby liable to spontaneous combustion on exposure to the air.

It is important to render the second method still more perfect: the following means might be advantageously employed; the combustion of the wood employed effects the conversion into *ligneux* which is thus raised to a temperature of 150° Centigrade: All the water contained in this wood escapes in vapor, but the heat contained in this vapor and in the *ligneux* should be made useful as well as the latent heat contained in the vapor. For this, three successive chambers will be necessary; the wood loaded on wagons passes in succession from one chamber to another; in the first chamber the wood will begin to be heated and to dry by means of the latent heat of the vapor, disengaged in the second, and condensed in the third, and also by means of the latent heat of the air cooled in the third and brought back to the first. It is in the second chamber that the entire conversion of the wood into *ligneux* takes place: the *ligneux* will pass into the third chamber to cool; the heated air will be conducted to the first chamber to heat another load of wood; the vapor which is found there, and which comes overheated from the second chamber, will be condensed, and thus will give more heat to the first chamber, with which it communicates by pipes.

In following the preceding method, it is possible to change 10 parts of wood (standing for 1·00 of *ligneux*, 0·40 of water) into *ligneux*, by means of one part of wood employed as a combustible.

There is another method more economical which might be employed to convert the wood into *ligneux;* it consists in utilizing the wasted flame of the metallurgic apparatus after having, of course, previously used it for other purposes; for example, heating the cauldrons, because, on coming from the apparatus the gas is of too high a temperature for the operation in question, and is still sufficiently hot after having been em-

* It is unnecessary in this memoir to describe either the chamber in which this process takes place, or the requisite apparatus and details of the different processes.

ployed for the previous processes. But this method by which economy is carried to the utmost extent, though very suitable in France or Germany, does not seem necessary in America, on account of the cheapness of the vegetable combustible. Thus far we have only explained, and very briefly, the first part of the new method of manufacturing iron. We now come to the second part, which is the *puddling process* with *ligneux;* the puddling, it is well known, is effected by burning in a reverberatory furnace the combustable gases which come from a lateral fire-place: the important part of the operation is, to conduct into the furnace a sufficient quantity of air, to produce a total combustion of the gaseous substances. Generally, too much air is admitted, which has the disadvantage of uselessly absorbing the heat. Mineral combustibles are much better adapted than wood to the operations of the puddling furnace on account of their superior density; they develop a greater quantity of heat and also produce a more regular current of gas; besides which, the interstices between the pieces of wood permit too much air to pass. In the new puddling process, the quantity of air introduced into the furnace is, so to speak, mathematically regulated: the combustible mixture and the current of air which serves to ignite it, are admitted separately into the laboratory: here, the fire-place must be of entirely different dimensions. It is very long vertically, the grate is very low, and composed only of a few bars to support the wood: the air no longer enters freely into the fire-place; the bellows send a graduated current of air under the wood, which traverses it, producing its distillation. On account of the pile which the air is obliged to traverse, this distillation takes place, so to speak, in a gradual and progressive manner: the air thus admitted into the lower part, is in proportion to the quantity of *ligneux* required to be carbonized in a given time. The current of combustible gas which is found in the pile of wood passes into the laboratory, where the puddling takes place, and is met by a current of air carefully regulated and driven through a pipe; thus the laboratory obtains, instead of an ordinary flame, a combustible gas free from all traces of pure oxygen. Nothing is more easy when one understands the composition of *ligneux*, than to know the exact quantity of air to admit into the furnace. But in what proportion shall the whole amount of this quantity be divided? How much shall go to the furnace and how much to the laboratory? This is a question which experience alone can answer. We can only say in general, that the latter proportion depends upon the more or less combustibility of the mixture of gases, and consequently on the temperature required in the furnace, the rapidity of the distillation, and the operation itself.

This last term has evidently in all cases a limit, which fixes the proportion to be established between these two currents of air. Registers also connect them with each other, which can be managed by the workmen themselves. This mode of combustion is very remarkable, both theoretically and practically; it produces a very great regularity in the labor, and gives a current of very pure gas: the purification of the cast-iron is thus effected under the most favorable circumstances, and even very impure kinds give excellent iron. It is quite otherwise, it is well known, with the ordinary method of puddling with coal, and we may assert in general, that the impurity of iron is attributable less to the cast-

iron than to the imperfection of the mode of reviving. In the United States the cast-iron made with wood or anthracite, would never be of a very bad quality ;* the admirable perfection of the puddling with *ligneux* would warrant the excellence of the products of the new method. It now remains, and this is the main point, to consider the economical conditions of the question.

The following are the facts of the case, the exactitude of which we will warrant.

The consumption of cast-iron, labor, and *ligneux*, are per ton of iron:

Cast-iron,		tons 1·242	
Labor	For the puddling,	days 3·86	11·35.
	For forging and rolling,	" 4·69	
	Sundry processes,	" 2·80	
Ligneux	For the puddling,	tons 1·20	2·50
	For forging and rolling,	" 1·30	

This estimate may serve to establish the *special* expenses in each particular case: in order to establish the *general* expenses, it will be necessary to obtain information on the following points:

1st. The purchase of land.

2d. The price of building, materials, stones, bricks, clay, etc., etc.

It will be important, in order to diminish as much as possible the total amount, to choose a situation where wood is cheap and abundant and in the neighborhood of the mines, from whence the ore could be brought at a small expense. (In case it should be preferable *not* to manufacture the cast-iron, this last observation applies to the cast-iron which it would be necessary to buy.) It is also important to take into account the means of transport of the produce, to the great industrial markets, by canal or railroad; the price of labor, etc., etc.

It would be well perhaps to annex to the establishment, a manufactory of cast-steel; the *ligneux* would be very suitable for this species of manufacture; and it would be very easy to prepare for this purpose, iron of the best quality. The establishment of the works required by this new method, must be on a very large scale; its success depends almost entirely on the employment of the most economical means of manufacturing *ligneux;* this condition can only be fulfilled by preparing the ligneux in great quantities, and consequently the metallurgic apparatus must be very numerous.

The solution of this problem, which we have been examining, is in the highest degree important to the future progress of industry in the United States. It will enable them to employ to advantage, the mineral wealth scattered over their territory, and upon a point of the utmost consequence, will render them independent of other nations. It therefore eminently deserves the attention of the metallurgist and the manufacturer.

* It remains to be seen, perhaps, if it would not be advantageous to manufacture the cast-iron also with ligneux.

For the Journal of the Franklin Institute.

Description of an Apparatus for Broiling by Gas Heat.

The apparatus shown at the June meeting* of the Institute for this purpose, has proved so effectual after having been in daily use by myself for several weeks, that I am desirous of saying a few words descriptive of it in the *Journal*.

It is simply a system of tubes brazed together in the form exactly of a gridiron; the tubes represent the bars, having small holes drilled with a needle through them, half an inch apart. The gas entering these by a tube in the position of the handle of the gridiron burns in a number of jets. This burner should be made to be used with and on the pattern of the ordinary guttered gridiron, so that a row of flames comes under each bar; in this way, when the burner and gridiron are kept parallel to each other, and inclined by a support soldered to a shallow tin pan, there is no danger of the fat falling into and stopping up the holes of the burner. In any event, there is little annoyance from this source, as proved by my own apparatus, which was constructed by myself, and without any particular care. The burner should be brought as closely to the gridiron supporting the object to be broiled, as is possible, without the gas smoking, and the object is cooked in a few minutes. The burner may be made of brass tubing, as nothing but fat falls, (which is caught in the tin pan,) all the gravy being retained in the meat, and which flows out when the latter is cut.

I do not know whether this method has been used before, though I suppose it has been; at any rate, it is a method I can recommend from experience, having used it for mutton-chops, beef-steaks, spring chickens, and oysters. By placing the burner horizontally, a vessel placed on the gridiron will be sufficiently heated for boiling or frying, or it may be used for toasting bread. The cost of the whole apparatus is very trifling.

C. M. W.

For the Journal of the Franklin Institute.

The Transatlantic Steamship Herman. By B. F. Isherwood, Chief Eng. U. S. Navy.

(Continued from p. 57.)

Conditions under which the evaporation by the boilers is calculated.

During the entire steaming with both sets of boilers, the temperature of the feed water was carried very regularly at 120° Fahr., and a sufficient amount of "*blowing-off*" was done to maintain the sea water in the boilers at one and three-quarters the natural concentration. The initial steam pressure in the cylinders was three pounds per square inch less than in the boilers, and the steam space between the pistons and cut-off valves at *one* end of *both* cylinders was 22 cubic feet.

With the first boilers, the natural draft, though good, was insufficient to consume on the small area of the grates, the large amount of coal required to generate a sufficient supply of steam. To effect this purpose, an artificial blast was used, obtained from centrifugal fans driven by small

*Not the apparatus mentioned in the Report of the Meeting, mine having been omitted.

independent steam cylinders. These centrifugal fans were constantly required to be driven at a high velocity, and the amount of steam required to work the small blowing engines was, from as close a calculation as can be made without Indicator Diagrams, five per centum of the amount of steam used in the large engines. This five per centum is included in the calculations of the evaporation.

With the last boilers, only the natural draft was used.

The calculations for the Evaporation by the Boilers, contained in the following Table, are made for the above conditions, using Regnault's Determination of the latent heat of steams; and they include the loss by "*blowing-off*" to maintain the above concentration of the sea water in the boilers; they also include the steam comprised between the pistons and cut-off valves, and the steam used to drive the fan blast with the first boilers.

Evaporation by the Boilers.

	First Boilers.		Last Boilers.	
	Burning Pennsylvania anthracite.	Burning Welsh anthracite.	Burning Cumberland bituminous.	Burning Welsh anthracite.
DATA.				
Steam press. in lbs. pr sq. in. above atmosphere in boilers,	11·9	11·1	11·6	13·5
" " " " in cylinders,	8·9	8·1	8·6	10·5
Steam cut-off at in cylinders, in feet from commencement of stroke of pistons, . .	5·000	5·334	3·517	3·908
Number of double strokes of pistons made per minute, ...	10·086	9·219	10·250	10·326
Pounds of coal consumed per hour, .	3794	3474	3376	3470
Total time of steaming, in hours and minutes,	780 50	904 50	1573 37	1639 53
Total number of tons of coal consumed, .	1322·571	1403·442	2372·083	2540·525
RESULTS.				
Pounds of steam evaporated per hour by one pound of coal, ...	6·785	6·894	5·236	6·095
Pounds of steam evaporated per hour from one square foot of heating surface, . .	4·332	4·030	2·115	2·532
Cubic feet of steam of atmospheric pressure furnished per minute, . . .	11670·954	10858·155	8012·440	9587·320
Pounds of coal consumed pr hour pr sq.foot of heating surface,	0·638	0·585	0·404	0·416
" " " of grate surface,	20·732	18·984	12·079	12·415

Particular attention is called to the results given in the above Table; they establish,

1st. That of the two sets of boilers; the first boilers were of superior type in *economical* evaporation, giving, with the Welsh anthracite, 13·19 per centum higher result than the last boilers, although, with the first boilers, the coal was burned with a powerful artificial blast, at the rate of 18·984 pounds per hour per square foot of grate surface, and a proportion of 32·48 square feet of heating surface per square foot of grate surface to absorb the large amount of caloric evolved; while with the

natural draft of the last boilers, there was only burned per hour 12·415 pounds of coal per square foot of grates, with a proportion of heat absorbing to grate surface of 29·88 to 1·000. It will be perceived that the rate of evaporation in the first boilers per square foot of heating surface, was about twice that of the last boilers. Had the consumption of coal per square foot of grate surface, or in other words, had the velocity of the draft been the same in both sets of boilers, the first set must have given a still higher comparative *economical* result. As regards the *potential* result, the first boilers were, likewise, superior to the last, furnishing 11·69 per centum greater bulk of steam in equal times, using the Welsh anthracite.

2d. That the Pennsylvania and Welsh anthracites, gave very nearly the same economical effect, the latter exceeding the former 1·61 per centum: this is about the same result as given by the burning of the same coals in the boilers of the steamships "*Pacific*" and "*Arctic*" of the Collins' line, related in previous numbers of this *Journal*, and arises from their almost identical chemical composition, the chief difference consisting in the Pennsylvania anthracite, having a few per cent. most slate, and making in the furnace more clinker.

3d. That the Welsh anthracite, (with last boilers,) gave a superior economical evaporation over the Cumberland bituminous coal, of 16·41 per centum, and consequently, the Pennsylvania anthracite, a similar superiority of 14·58 per centum. This is also about the same result as given by the burning of these coals in the boilers of the above named steamships, though, showing less superiority than in these cases, because the boilers of the "*Pacific*" and "*Arctic*" giving a higher economical evaporation than the boilers of the "*Herman*," absorb more of the total heat evolved, and show in a more marked manner, the relative steam generating powers of the coals.

The reader will not fail to remark, that the foregoing conclusions are not derived from a few short experiments on a few tons of coal; but are based on a course of many days continuous steaming, and the consumption of many hundred tons of coal. This coal was burned under the ordinary conditions of actual practice, by experienced engineers and firemen, wholly disinterested, and only desirous of obtaining the highest result from all, in order to make the best possible speed, and, as speed of vessel was the first object to be attained, the boilers and fuels were so managed, as to obtain from them their utmost maximum performance. Their conclusions are therefore entitled to a confidence which is not given by practical men, and wisely so, to the laboratory experiments of philosophers.

Relative Efficiency of the first and last paddle wheels.

The difference between the two paddle wheels was what resulted from reducing the width of the paddle from 36 to 26 inches, or a reduction of 28 per centum; and in making the paddle in one piece instead of two pieces, bolted on opposite sides of the arms. Similar alterations have been made in the paddles of nearly all the New York steamers, and will illustrate the force of fashion even in such things; for, although the change has become general, yet so far from being based on the results of

accurate experiments, it appears to be in opposition to them, and in opposition also to the nature of things. A few years ago the split paddle, as it is termed, (the same as the "*Herman's*" first paddles,) was equally fashionable, and all steamers were fitted with it; it had the slight disadvantage of offering the direct resistance of another paddle edge to immersion and emersion, and the considerable advantage of relieving the paddle more quickly of the water it carried up on emerging: also, one-half the paddle being in advance of the other some four or five inches, (the width of the arm,) there was produced less concussion on the water than with the single piece paddle. The mere substitution, however, of the single for the split paddle, would hardly have produced a perceptible difference, so long as the same total width was preserved; but when the fashion extended to converting broad into narrow paddles, the result, as might have been anticipated, was an increase of the slip, and to the amount of that increased slip, a consequently increased loss of useful effect from the power.

In the different voyages of the "*Herman*," the effect of the alteration of the paddles on the slip cannot be seen from the calculated slips alone, on account of the different resistance offered by the same vessel to the paddles when experiencing different weather. In estimating the effect, then, of the decrease in the paddle surface, the weather must be included as a governing element, and the best method of ascertaining the different resistances of the vessel, caused by differences of weather in the various cases, will be to eliminate from the total power developed by the engines, the power actually applied to the propulsion of the vessel.

For this purpose, the pressure required to work the engine, *per se*, will be taken at one pound per square inch of piston, for a speed of ten double strokes of piston per minute, and for any variation from this speed to be increased or decreased in the direct proportion of the speed. The power required to overcome the friction of the load, will be taken at Morin's coefficient of 7½ per centum of the total power developed. These friction resistances must *first* be taken from the total or gross power developed by the engines, as it is evident they must *first* be overcome before the engine can move at all or develop power; and the remainder only of the total power is what is applied to the paddle wheel. Of this remainder a certain portion is uselessly expended in what is called the oblique action of the paddles, resulting from the facts that the power of the engine is applied at *right angles* to the paddles, but is transmitted by the paddles to the water *obliquely* to the vessel's motion; there is consequently at the water, a decomposition into two resultants of the power applied to the paddles, the one resultant being horizontal in the direction of the vessel's motion, and the other vertical at right angles to the vessel's motion; the latter is, of course, uselessly expended, and the proportion of this vertical resultant to the whole power considered as unity applied to the paddles, is what is termed the oblique action, which is calculated in the following case in the ratio of the squares of the sines of the angles of incidence of the paddles on the water, for every ten degrees variation in immersed position, and the mean taken. The power composing the horizontal resultant produces two effects, the one a forward motion of the vessel, the other a backward motion of the column

of water pressed by and yielding by its mobility to the pressure of the paddles; this latter is termed slip, and as the pressure by the paddles producing the advance of the vessel and the recession of the water is the same, it is evident that the relative power expended in the propulsion of the vessel and on the slip, will be in the proportion of the speed of the vessel to the speed of the slip; the power in the horizontal resultant being divided in this proportion, gives, separately, the power expended in propelling the vessel and on the slip.

There are other small losses of useful effect by the paddle wheel, but they are so small, even in their aggregate, that it is unnecessary to include them in a general calculation; they are the friction of the paddles on the water, the direct resistances of the lower and upper paddle edges to immersion and emersion, and the displacement of water equal to the bulk of the paddles.

Omitting these, the data of the following Table of calculations are positive, with the exception of the pressure required to work the engines alone, which pressure is estimated, as above stated, from experiments on other similar engines, and can be but little from the truth:

Disposition of the Total Power Developed by the Engines of the Herman.

	FIRST PADDLE WHEEL.		LAST PADDLE WHEEL.	
	New York to Bremen.	Bremen to New York.	New York to Bremen.	Bremen to New York.
Mean gross effective pressure in lbs. pr sq. in. of piston,	16·00	15·90	13·00	15·30
Pressure in pounds per square inch of pistons—				
Required to work the engines *per se*, . .	0·98	0·92	1·02	1·03
Required to overcome the friction of the load,	1·20	1·19	0·98	1·15
Applied to the paddle wheel, . . .	13·82	13·79	11·00	13·12
Expended in the oblique action of the paddles,	2·79	2·78	2·22	2·65
Applied in the direction of the vessel's motion,	11·03	11·01	8·78	10·47
Expended in the slip of the paddles, . .	1·39	2·14	1·24	2·04
" " " propulsion of the vessel, .	9·64	8·87	7·54	8·43
Number of double strokes of engine's pistons made per minute, ...	10·086	9·219	10·250	10·326
Horses power expended in the propulsion of the vessel,	478	404	381	430

For the purpose of ascertaining the relative resistances of the vessel in the four cases presented, it will be necessary to modify the "horses power expended in the propulsion of the vessel," as given in the above Table, so as to make them correspond to an uniform speed of vessel, for which nine geographical miles per hour will be selected. This modification will be made in the ratio of the cubes of the actual speeds, compared to the cube of the speed, nine miles per hour. Then, as the normal resistance of the vessel was, of course, always the same, the difference in the horses powers thus obtained will represent the differences in the resistances of the vessel caused by difference of weather.

Making the necessary calculations, we obtain the results contained in the following Table, viz :—

	Actual speed of vessel in geographical miles per hour.	Horses power expended in the propulsion of the vessel at the actual speed.	Horses power required for the propulsion of the simple vessel at the speed of nine geographical miles per hour.	Relative resistance of the vessel caused by difference of the weather.
First Paddle Wheel.				
From New York to Bremen,	9·236	478	442	1·2774
From Bremen to New York,	7·778	404	626	1·8012
Second Paddle Wheel.				
From New York to Bremen,	9·290	381	346	1·0000
From Bremen to New York,	8·840	430	454	1·3121

Now, the slip of a propelling surface in water is caused simply by the difference in the resistance of the body propelled and of the water acted on or pressed by the propelling surface; consequently, the slips of the same propelling surface should be a true measure of the resistances of the bodies propelled, supposing that any difference in the slips do not alter the conditions under which the propelling surface acts. With paddle wheels, the propelling surfaces are simple rectangular planes, situated so far apart that a considerable variation in slip does not very materially affect their propulsive power, though it does, in a degree, sufficient to be sensible, inasmuch as the efficiency of the paddle decreases with the increase of slip, on account of the consequently greater velocity caused by the slip of the water acted on by the paddles in the direction of the paddles' motion; whence, results that with increased resistance, the slip of the paddle ought to increase in a ratio somewhat higher than direct; as, however, this variation from a direct ratio is not great, for the cases occurring in ordinary practice, it will lead to no great practical error to neglect it in making the following comparison between the resistances of the vessel, as determined in the immediately preceding table, and from the slips of the paddles, as follows, comparing the *same* paddle wheel in its two cases.

In the first case, with the first paddle wheel, we find the mean slip for the voyages from New York to Bremen to be 12·60 per centum; and for the voyages from Bremen to New York to be 19·48 per centum, or the slip in the latter is $\left(\frac{(19{\cdot}48-12{\cdot}60)\times 100}{19{\cdot}48}=\right)$ 35·32 per centum greater than in the former. Now the relative resistances of the vessel in these

voyages, was, from the preceding table, 1·2774 and 1·8012, or in the latter it was $\left(\frac{(1{\cdot}8012-1{\cdot}2774)\times 100}{1{\cdot}8012}=\right)$ 29·08 per centum greater than in the former.

In the second case, with the second paddle-wheel, we find the mean slip for the voyages from New York to Bremen to be 14·78 per centum; and for the voyages from Bremen to New York to be 19·50 per centum, or the slip in the latter is $\left(\frac{(19{\cdot}50-14{\cdot}78)\times 100}{19{\cdot}50}=\right)$ 24·21 per centum greater than in the former. Now the relative resistances of the vessel in these voyages, was, from the preceding table, 1·0000 and 1.3121, or in the latter it was $\left(\frac{(1{\cdot}3121-1{\cdot}0000)\times 100}{1{\cdot}3121}=\right)$ 23·79 per centum greater than in the former.

From the two immediately preceding paragraphs, it appears that, practically, within the ordinary limits of practice, the slip of the paddle wheel may be taken to increase in the same ratio with the resistance thrown upon it. On this assumption, it is easy to compare the slips of the first and second paddle wheels with equality of resistance, as follows, viz. The resistance of the vessel in the voyages from New York to Bremen with the second paddle wheel was 1·0000, and with the first paddle wheel 1·2774, or 27·74 per centum of the former greater. Now, in these cases the slip with the first paddle wheel was 12·60 per centum, and with the second paddle wheel 14·78 per centum; if, therefore, the 14·78 be increased 27·74 per centum, it will become 18·88 per centum, which ought to have been the slip of the first paddle wheel if it had had only the same propulsion power as the second; but we find that the slip of the first paddle wheel was actually 12·60 per centum, or $\left(\frac{(18{\cdot}88-12{\cdot}60)\times 100}{18{\cdot}28}=\right)$ 33·26 per centum less than the slip of the second paddle wheel. Again, the resistance of the vessel in the voyages from Bremen to New York with the second paddle wheel was 1.3121, and with the first paddle wheel 1·8012, or 37·28 per centum of the former greater. Now, in these cases, the slip with the first paddle wheel was 19·48 per centum, and with the second paddle wheel, 19·50 per centum; if, therefore, the 19·50 be increased 37·28 per centum, it will become 26·76 per centum, which ought to have been the slip of the first paddle wheel, if it had had only the same propulsive power as the second; but we find that the slip of the first paddle wheel was actually 19·48 per centum, or $\left(\frac{(26{\cdot}76-19{\cdot}48)\times 100}{26{\cdot}76}=\right)$ 27·20 per centum less than the slip of the second paddle wheel. Proceeding in the same manner, and making the comparison between the first paddle wheel in the voyages from New York to Bremen, and the second paddle wheel in the voyages from Bremen to New York, we obtain for the first paddle wheel 33·68 per centum less slip than the second paddle wheel. And

again, comparing the slips of the first paddle wheel in the voyages from Bremen to New York, and the second paddle wheel in the voyages from New York to Bremen, we obtain for the first paddle wheel 26·77 per centum less slip than the second paddle wheel. The mean of the above four determinations is $\left(\frac{33{\cdot}26+27{\cdot}20+33{\cdot}68+26{\cdot}77}{4}=\right)$ 30·23; that is to say, the propulsive power of the first paddle wheel, was 30·23 per centum greater than the propulsive power of the second paddle wheel, taking the latter as unity. Now, the propelling surfaces of the two paddle wheels compared as their widths of paddles, viz., 36 and 26 inches, or the surface of the first paddle wheel was $\left(\frac{36-26\times100}{26}=\right)$ 38·46 per centum greater than the surface of the second paddle wheel, taking the latter as unity. The conclusion, therefore, is, *that increasing the width of a paddle from* 26 *to* 36 *inches, or* 38·46 *per centum, decreases the slip* 30·23 *per centum, that is to say, if the absolute slip in the first case was* 20·00 *per centum, it will in the second case be* 13·95 *per centum*, which is also about the conclusion to which a plain common sense view of the matter would lead.

For the Journal of the Franklin Institute.

Trial Trip of the United States Screw Steamer, "San Jacinto," with new machinery.

An account of this ship and the trial trip made in New York Bay, in October, 1851, was published in this *Journal*, Vol. xxii. p. 339, 3d Series. Subsequently to the trial referred to, the ship was sent round to Norfolk, broke down on the trip, and after being repaired, was ordered to the Mediterranean. Thence she returned, after eighteen months' absence, a great portion of which time was occupied in repairing, with her engines crippled. An examination was then held by a Board of Engineers appointed for the purpose, and the engines and propeller were condemned and sold. The boilers, which were of copper, were found to be in good condition, and were left on board. The original engines were defective in plan and proportion, and the propeller had too much pitch, and gave too large a per centage of slip. Owing to the repeated failures and enormous cost of our naval steamers, which had previously to this time been built from plans furnished by the Department, by contractors who, of course, assumed no responsibility, it was decided by the Secretary of the Navy to contract for the new engines and propeller for the *San Jacinto*, on the system pursued in the mercantile marine, viz: paying a lump price for the whole, completed in accordance with general plans prepared by the contractors and approved by the Department, the detail and proportions being left to the former, they assuming the whole responsibility of the successful operation of the engines, and guaranteeing for a certain period of time against any defects of material or workmanship. Proposals on this basis were accordingly issued, and the plan and tender of Merrick & Sons, of Philadelphia, for a pair of geared

engines and three bladed screw, was accepted in September, 1853. The machinery constructed by these gentlemen having been completed, was tried at sea, from June 30th, to July 7th, and having performed satisfactorily, has been accepted by Government.

The present machinery of the *San Jacinto*, consists of two horizontal cylinders placed athwartships, and on the same side of the ship, the pistons connecting to cranks at right angles on a shaft carrying four mortise spur wheels, placed side by side and gearing back into iron pinions on the propeller shaft, which passes under the guides of the piston rods. The air-pumps are worked by overhead beams connected to the main crank-pins. The cylinder piston-rods pass through the back heads and play in close copper casings. The general form of the engines is similar to that of H. B. M. S. "*Dauntless.*" Between the cylinders is a tubular condenser, constructed on "Pirsson's Equilibrium Fresh Water" patent. The steam and exhaust valves are equilibrium poppet valves, and steam is cut off by Allen & Wells' adjustable arrangement. The engines are on deep cast iron bed-plates, and are connected together at the cylinder end by the condenser. The force and bilge pumps and fresh water air pump, are placed between the forward engine and the fire room, and are worked from an independent shaft gearing into the propeller shaft. Each boiler has a separate connexion to its own force pump, so that either salt or fresh water may be fed into either. The fresh water air pump is used to withdraw the fresh water or condensed steam, and the uncondensed vapor, from the condenser, and pump it into a reservoir, from which it is taken by the force pumps.

The boilers are the same (three in number) as were previously in the ship.

The propeller is a true screw of brass, three bladed; a clutch coupling permits its disengagement from the engines when the ship is under sail.

The following are some of the principal dimensions and proportions of the machinery:

ENGINES—

Diameter of cylinders,		5 feet	10 inches.
Stroke,		4 "	
Diameter of air pumps,		3 "	2 "
Stroke,		2 "	
Breadth of ship occupied by engines,		24 "	
Length " " "		23 "	
Diameter of spur wheels, (wooden cogs.)		10 "	1½ "
" pinions,		4 "	5¾ "
Face of each pinion,			10 "
" all		3 "	4 "
Pitch,			4
Proportion of gearing	1 to 2¼ inches.		
Maximum revolutions of engine,	25.		
" " propeller,	56¼.		
Tubular surface in condenser,	1550 sq. feet,		
being disposed in 1240 copper tubes, 1 inch diameter, 5 feet long.			

PROPELLER—True screw.

Diameter,		15 feet.	
Pitch,		22 "	6 inches.
Length,		3 "	
Blades,	3	3	
Proportion of pitch, 4-10ths.			

The performance on the trial will be seen from the following abstract; it should be borne in mind that the vacuum given is the vacuum *in the cylinders*, the attachments being made in the steam chest directly above the nozzles; it therefore is apparently lower than usual. From some causes, probably incident to new machinery, the vacuum steadily improved during the trial, and has since been still further improved by a slight alteration to the condenser.

The condenser performed well, furnishing more than enough fresh water for two out of the three boilers.

The coal on board, was a lot of anthracite, taken from the Philadelphia Navy Yard, which had lain there exposed to the weather for some months. It was pronounced, by the Board of Engineers, to be of a very inferior description, and gave much trouble during the whole trip. From this cause the head of steam was at no time so high as it should have been, although, from past experience with the boilers, it is known that they are of ample capacity.

Conditions of the Ship on the Trial.

Draft of water forwards,	16 feet 6 inches.
" " aft,	17 " 6 "
" " mean,	17 "
Displacement at that draft,	2176 tons.
Midship section immersed,	486·55 square feet.

Speed and Slip of Screw.—The Massey's patent log, (belonging to the U. S. Coast Survey,) was unfortunately lost overboard on the third day out. After that time, therefore, no means existed of ascertaining the true speed of the ship. The chip log employed was evidently unreliable, giving about the same indication when the engines were making 16½ and 20½ revolutions per minute. The following data are the only ones obtained on the trial which can be relied on:

July 1st, 9 to 12, A.M.—Revolutions of engines by counter, 3780, or advance of propeller, . . . 191,268 feet.
Massey's log showed 23⅞ knots of 6120 feet, or advance of ship, 146,125 "

Slip of screw, 23 per cent., . = 45,143 "

Sea smooth, light wind ahead.

July 1st, 5 to 8, P. M., revolutions of engines,	3420
Distance run by Massey's log,	21¼ knots.
Advance of propeller,	173,962 feet.
" " ship,	130,050 "
Slip of screw, 25·23 per cent.,	= 43,912 "

Wind ahead, sea nearly smooth.

July 2d, 8 to 12, A. M., revolutions of engines,	4320
Distance run by Massey's log,	29¼ knots.
Advance of propeller,	218,592 feet.
" " ship,	179,010 "
Slip of screw, 18·1 per cent.,	= 39,582 "

July 7th, in Delaware river, distance run as follows:—

Distance by shore-marks from Breakwater to Navy Yard,		101·50 stat miles.
By adverse tide, 8 hours; less favorable tide, 4 hours, or 4 hours of current at two miles per hour,	.	8
Real distance run,	.	109·50
Revolutions of engine,	14,522	
Advance of propeller,	.	734,813 feet.
" " ship,	.	578,160 "
Slip of screw, 21·3 per cent.,	.	= 156,653 "

It will be observed that the best speed noted above was 8 knots per hour, at which time the pressure of steam was 16½ lbs.; vacuum 21 inches, and revolutions 21 per minute, with light wind ahead.

With proper coal and good firing, there is, therefore, no doubt that a speed of 9 knots per hour may be easily maintained in smooth water, at ordinary load draft.

Average Performance at Sea under Steam Alone.

Date.	Hours steaming.	Steam Pressure in Cylinders in pounds.	Vacuum at Cylinders in inches.	Throttle open.	Cutting off at from comt. stroke inches.	Revolutions per minute Eng.	Pro.
July 1,	17	11·9	21·5	¾	26	19·9	44·8
" 2,	13	9·3	21·5	½	26	18.	40·5
" 3,	20	12·1	22·7	½	26	20·1	45·3
" 5,	12	13·	23·	¾	26	19·3	42·4
" 6,	12	9·6	22·9	⅜	26	17·6	39·6
" 7,	13	13·6	23·2	¾	26	20·6	46·3

Best Performance at Sea under Steam Alone.

Date.	Steam Pressure in Cylinders in pounds.	Vacuum at Cylinders in inches.	Throttle open.	Cutting off at from comt. stroke inches.	Revolutions per minute. Eng.	Prop.
July 1,	18·	22·5	¾	26	22·5	50·6
" 2,	14·	22·	½	26	21·	47·3
" 3,	16·	23·2	⅝	26	22·	49·5
" 5,	17·	23·5	open	26	21·1	47·5
" 6,	9·	23·5	⅜	26	20·	45·0
" 7,	13·	23·8	open	26	20·8	46·8

Performance under Sail.

Various trials were made of the capabilities of the ship with the wind in different directions. It was found that the propeller uncoupled would revolve at a speed varying from 9 to 12 per cent. from that due to the velocity of the ship; the resistance therefore, in sailing, offered by the propeller is trifling. With the propeller coupled and dragging, a reduction in speed of ship from 5¾ to 4⅛ knots or 29 per cent. was experienced. The ship was found to steer well, and to tack easily with a light breeze.

On the Results of a series of Experiments on the Decomposition of Water by the Galvanic Battery, with a view to obtain a constant and brilliant Lime Light. By the Rev. N. J. CALLAN, Prof. of Nat. Philos. in the Rom. Cath. Coll. Maynooth.*

Soon after I had discovered the nitric acid and cast-iron battery, and before I had completed the large one which I made for the College, I began to make experiments on the decomposition of water with a view to obtain a lime light which might answer for light-houses. I soon succeeded in obtaining a steady and brilliant light. In a paper on our new galvanic battery, dated April 6, 1848, and published in the *London Philosophical Magazine* of the following July, I stated that "I got the lime light by igniting mixed gases as they were produced by the decomposition of water and throwing the flame on lime." I believe I was the first who obtained a constant lime light by means of the galvanic battery. My experiments were frequently interrupted on account of the state of my health. They were at one time suspended for more than two years, and several times for five or six months. The same cause which obliged me to interrupt them, now compels me to bring them to a close before I could complete all the experiments I intended to make. These experiments have led to the following results:—First, a new apparatus for applying with perfect safety the mixed gases, oxygen and hydrogen, to the production of a flame of the most intense heat, which, when thrown on lime, produces a most dazzling light. Secondly, a new voltameter, to which a common jet may be screwed, and the gases inflamed as they issue from it, without the smallest risk of injury, and by which the full decomposing effect of a battery of a hundred or five hundred pairs, arranged in one series, may be produced without exhausting the power of the battery more rapidly than if it contained only three or four cells. Thirdly, a new negative element, far cheaper, far more durable, and one which may be made to act more powerfully than the platinized silver used in Smee's battery. Fourthly, a new mode of protecting iron against the action of the weather and of various corroding substances, so that iron thus protected may be used for all the purposes to which sheet lead and galvanized iron are applied. Fifthly, a method of producing a brilliant intermittent lime light by means of a small galvanic battery. Sixthly, a new mode of exhibiting the dissolving views by means of the lime light. Lastly, a new sine galvanometer, which is the only instrument yet made by which very powerful galvanic currents can be measured.

The first result was a new apparatus for applying with perfect safety the mixed gases to the production of the oxyhydrogen flame and lime light. In my first experiments on the decomposition of water, I made use of a glass vessel containing dilute sulphuric acid and four parallel plates of platinized platina, each having a surface of about 14 square inches. The mouth of the vessel was stopped by a thick piece of wood, through which the wires from the electrodes passed. In this wood was cemented a tapped brass nut, to which a stop-cock and Hemming's jet might be screwed; the mouth of the vessel was made air-tight by cement.

* From the Lond., Edin., and Dub. Philos. Mag., Feb., 1854.

I soon found that with a glass vessel the use of Hemming's jet was unsafe. On one occasion, when I employed twenty 6-inch cells of our cast-iron battery, the Hemming's jet did not let out all the gases produced in the vessel; for after breaking the connexion between the battery and electrodes, the gases continued for some time to issue from the jet and kept up the lime light, although the battery had not worked for more than a minute or two. Had I allowed the battery to work nine or ten minutes, the gases would have been condensed within, and would have burst the vessel; I therefore saw that I must either get the gases separately, or devise some means by which the mixed gases might be safely inflamed, and might at the same time pass without much resistance from the glass vessel. I attempted both. To get the gases separate, I put a plate of porous earthenware between the electrodes so as to form two air-tight cells. I thus succeeded in obtaining the gases separate; but finding so much difficulty in making the cells air-tight, I gave up the idea of looking for the gases separately. In order to avoid dangerous explosions in igniting the mixed gases, and at the same time to allow them to pass freely to the jet, I sent them through water contained in an iron vessel, to the top of which was screwed the jet belonging to our large gas microscope and polariscope. The first iron vessel which I used was about 5½ inches high and 2 inches in diameter; its sides were an inch thick. This vessel was found to be too small. On two occasions, all, or nearly all the water was thrown out of the vessel through the jet; the flame went back and exploded the gases in the bags. On these two occasions the pressure was very irregular. The quantity of the gases contained in the bags was too small to be forced out by weights on the pressure boards. They were driven through the jet by a person who pressed frequently and violently on the bags with his arm. This violent and irregular pressure forced the water through the jet. Had the pressure been uniform, it is probable the explosions would not have occurred. Dangerous explosions can happen only because the water may be gradually ejected from the iron vessel through the jet or into the gas bag; or because, when the gases are made to pass rapidly through water in large quantities, there is a continuous series of large bubbles rushing through it; and should the uppermost bubble be ignited, the flame might possibly descend through the series of bubbles without being extinguished by the surrounding water. In the apparatus which I have made, a dangerous explosion from any of these causes is impossible. The apparatus consists of two wrought iron vessels of unequal size. The smaller is the one already described. The large one is about 7½ inches high and 4 inches in diameter; its sides are about $\frac{3}{8}$ths of an inch thick. On the top of the vessel is laid a collar of thick vulcanized India rubber. An iron plate about $\frac{3}{4}$ths of an inch thick is then screwed down to it by five iron bolts. The vessel is thus made air-tight. The top of this vessel is connected by an India rubber tube with the bottom of the small one; the bottom of it is connected by a similar tube with the gas bag, gasometer, or voltameter. The two vessels are nearly filled with water. The gas is sent into the bottom of the large one, ascends through the water, passes through the tube to the bottom of the small one, then through the water, and issues from the jet screwed to the top of the small vessel. Since the two

vessels are of very unequal size, it is impossible that all the water should be carried out of both at the same time by the stream of the gases; and should an explosion occur after the small vessel became empty, the flame would be stopped by the water in the large vessel. In each vessel the gases are made to pass through wire-gauze or perforated zinc, or through small pieces of porous earthenware, in order to break the bubbles, and thus prevent the gases from ascending in a continuous series of large bubbles. To prevent the water from being driven into the gas bag or voltameter which may be used, I have put a strip of vulcanized India rubber across the hole through which the gases enter into each of the iron vessels. The strip of vulcanized India rubber acts as a valve, which opens inwards and admits the gases into the vessel; and when pressed outwards by the expansive force of the exploded gases, it closes the hole and prevents the escape of any part of the water into the gas bag or voltameter. Hence it is evident that in our apparatus dangerous explosions cannot happen, either because the water may be gradually ejected from the iron vessel through the jet or back into the gas bag, or because the flame might ascend through a continued series of bubbles of the mixed gases. The size of the iron vessels should be in proportion to the quantities of mixed gases inflamed, and to the length of time the flame is kept up. Should a person wish to continue the lime light for a very long time, he would do well to have two pairs of vessels and change them every hour or half-hour, or examine occasionally whether the water was carried away by the stream of the gases. I have several times tried the large vessel alone without any accident, although the gases above the water occasionally exploded when they were not pressed through the jet with sufficient force. I believe that this vessel may be used alone without danger; but I would recommend in all cases the use of two vessels, one of which should be a good deal larger than the other, that the small one be about 3 inches in diameter and 6 inches high, and that the experimenter examine occasionally whether they contain water. I always kept the gas bag in a place in which, though an explosion should occur, no injury could be done to any person. On one occasion I filled the small iron vessel with shot instead of water. The shot prevented the return of the flame for a little time, but after five or six minutes the gases in the small vessel and in the upper part of the large one exploded, but the flame did not descend through the water. The mixed gases which I employed were always obtained by the decomposition of water. One of the gas bags commonly used for the gas microscope and polariscope may be filled in two or three hours by a cast iron battery of six cells and as many zinc plates, each 6 inches square. I always employed nitrosulphuric acid which had been previously used. Acid which had been used before, answers very well for producing decomposition; because, for this effect, the cells of the battery must be so arranged that its intensity will not exceed that of three, or at most four cells in series. When the gases are obtained by the decomposition of water, they are always mixed in the proportions in which they answer best for the production of intense heat and light; hence, when it can be done without danger, it is better to produce the lime light by the decomposition of water than by getting the gases into separate vessels, and then mixing them in the proper pro-

portions. With half a dozen of cells of the cast-iron battery, a voltameter, a pair of gas bags, and the apparatus just described, the gas microscope and polariscope, as well as the dissolving views, may be exhibited. But the experimenter must, until he acquires experience, proceed with great caution.

The second result was a new voltameter, to which a common jet may be screwed, and the mixed gases inflamed as they issue from it without the slightest risk of injury, and by which the full decomposing power of a battery of 100 or 500 cells arranged in one series may be exerted without exhausting the power or the battery more rapidly than if it consisted of three or four plates. This voltameter is new in every respect,—in the material of which it is made, in the manner in which the electrodes are connected with the opposite ends of the battery whilst the vessel remains air-tight; new in the metallic plates employed as electrodes, and in the arrangement of these plates; finally, new in the fluid which is used for the decomposition. After having succeeded in making the apparatus for preventing dangerous explosions, I found that a glass vessel was totally unfit for a voltameter such as I wanted: first, because it is extremely difficult to make a glass vessel permanently air-tight; secondly, because it is not sufficiently strong to bear the pressure of the condensed gases; thirdly, because on one occasion, by unscrewing a bag which I had filled with the mixed gases, a spark which was produced by accidentally breaking connexion with the battery, or by the contact and separation of the electrodes, inflamed the gases and caused an explosion which shattered the vessel. I fortunately escaped unhurt. The vessel which I have used for nearly the last two years is made of wrought iron about an inch thick. Its form is cylindrical, its height about 16 inches, and its inside diameter 6 inches. It is open at the top, which was turned flat in a lathe; the bottom is laid on a circular piece of wood, which is placed on an iron plate about $\frac{5}{8}$ths of an inch thick and 8 inches square. On the top of the vessel is laid a thick collar of vulcanized India-rubber, and on this an iron plate similar to the one under the bottom. In the top plate there are two holes, to one of which a stop-cock is adapted; to the other is fitted, air-tight, a perforated piece of brass which projects about an inch and a half above the plate. The hole in this brass is large enough to admit a thick wire. The upper part of the brass is tapped in order that a brass cap may be screwed to it, to prevent the escape of the gases through the hole. When the electrodes are placed in the vessel, one of them is connected by solder or pressure with the inside; to the other is soldered or riveted a copper wire, which passes through the hole in the brass screwed into the top iron plate. By means of four $\frac{3}{4}$-inch bolts of iron, which pass through the top and bottom iron plates, the top plate is screwed down on the India-rubber collar. The wire is then wedged against the side of the hole in the piece of brass, and the brass cap is screwed on. The board between the bottom of the vessel and under iron plate, and the India-rubber collar between the top and upper iron plate, insulate both plates from the iron vessel. The outside of the vessel is connected with one end of the battery, and the top or bottom plate with the other. Thus the two electrodes are connected with opposite ends of the battery; and if acidulated

water, or water containing any of the alkalies, be poured into the vessel, it will be decomposed by the voltaic current. If a stop-cock to which a jet is attached be screwed to the top plate, the gases will rush through the jet and may be ignited without the smallest danger, for the explosion of the gases contained within can never burst a vessel of such strength. I have had frequent explosions without producing any injurious effect, though the vessel was sometimes nearly half-filled with the mixed gases. Before discarding the glass vessel, I began to use sheet iron instead of platina electrodes. I found that when the intensity of the battery exceeded that of three or four cells, the power of the battery was soon exhausted; hence in using a battery of eighty cells, I was obliged to arrange them in twenty rows, each containing four cells, and to connect all the end zinc plates so as to form one, and all the iron cells at the other end so as to act as one. I also found, that, to obtain the full effect of the decomposing power of the battery, the acting surface of each electrode should be as large and a half as the acting surface of the zinc in each circle. Hence about 9 square feet of sheet platina, which would cost nearly 30*l*., are necessary for a voltameter large enough for a battery of eighty 4-inch plates, when they are properly arranged for decomposition. Platina plates are not only very expensive, but they are also very easily torn and rendered unfit for use. I used a pair of sheet iron plates about 4 feet long and 9 inches broad. To one of them I soldered a piece of thick sheet copper, and to the other a thick copper wire. I then covered one of them with linen, and rolled the two into a coil about 4 inches in diameter. I had then two plates of iron, nearly 3 square feet in surface, separated from each other by the interposed linen. The coil was put into the iron vessel. The copper plate soldered to one of the iron plates was connected with the inside of the vessel, and the copper wire attached to the other was connected with the perforated brass in the top. The vessel was then filled with a solution of carbonate of potash. I employed this solution in order to prevent the oxygen from attacking the positive electrode. When the plates were connected with the opposite ends of a battery, the water was rapidly decomposed, and a considerable quantity of the mixed gases obtained. From the intensity of the lime light produced by the gases, it appeared that the potash effectually prevented the combination of the oxygen with the positive electrode. The iron plates worked well for about an hour; the decomposition then began to decline very rapidly, though the battery was in good order. I then took up the iron plates, separated them from each other, and removed the linen cover. One of the plates was coated with a non-conducting black deposit. This was the first time I found such a deposit on either of the plates; on all former occasions they were separated from each other by slips of wood or gutta percha. I afterwards got a pair of lead plates, which I rolled up in the same way as the iron plates; they, too, ceased to act after some time, because one of them became covered with a black non-conducting substance. I then got four concentric hollow cylinders make of sheet iron $\frac{1}{8}$th of an inch thick, so that the largest of them fitted in the iron vessel. The first or innermost one was connected with the third, and the second with the fourth; they were separated from each other by wedges of wood, and also insulated from the bottom of the vessel. The

first and third were connected with the top plate, and the second and fourth with the side of the vessel. These acted tolerably well; but when I used a pair of lead electrodes with a battery of ten 6-inch plates, the lime light was considerably larger and more steady than when I employed the iron cylinders. Hence I resolved, if possible, to give up the use of iron electrodes. I saw at the same time that lead plates would not answer; for when they are placed near each other, a slight pressure, and sometimes even their own weight, brings them into contact with each other. It then occurred to me to try strong tin plates immersed for a few seconds in melted lead, or in a liquid alloy of lead and tin, in which alloy the quantity of tin would be small compared with that of lead. Not having any new tin plates at hand, I cut up some old tin vessels, and made three plates, each nearly 4 inches wide and 6 long. I coated one of them, by means of a soldering iron, with an alloy, containing about seven parts by weight of lead and one of tin; and another with an alloy containing about three parts of lead and one of tin. On the third, after being coated with the alloy, I sprinkled some powdered sulphur, and held the plate over the fire until the sulphur was inflamed: the plate was thus covered with a black coating of burnt sulphur. I then tried each of the three, and also a plate of lead about the same size, as the negative element of a nitric acid battery; that is, I put each successively, instead of platina or cast iron, into a porous cell containing nitrosulphuric acid. Each of the three acted far more powerfully than the lead plate. The plate coated with the alloy containing the largest proportion of lead acted better than the one whose coating contained least lead, but not so well as the plate on which sulphur was burnt. This last plate produced a galvanic current very nearly equal to that of a platina or cast-iron plate. I afterwards put into concentrated nitric acid a piece of the tin which was coated with the alloy of lead and tin, and with sulphur, a piece of one of the alloys of lead and tin and a piece of lead, and left them in the acid for about twenty hours. On taking them out of the acid, I found that a good deal of the lead had been dissolved, but the piece of coated tin and the alloy were merely blackened on the surface. From the results of these experiments, it is evident that tin plates, coated with an alloy of lead and tin, in which the proportions of tin is small, are more passive in nitric acid, less oxidable, and consequently better suited for the electrodes of a voltameter than lead plates. The tin plates are stronger and more elastic than leaden ones, and therefore are not so easily brought into contact with each other. It was in last March or April that I discovered that tin plates coated with an alloy of lead and tin, are less oxidable than lead. Since that time I have in all my experiments used the coated tin plates as electrodes. I have arranged these electrodes in two ways; in one way for a battery of low intensity, and in another for batteries of high intensity, or of a large number of cells all in one series. In one of the former arrangements there were twenty plates, each 12 inches by 4; they were all parallel, and separated from each other by slips of wood about $\frac{1}{16}$th of an inch thick. Ten of them were connected with one end of the battery; these were of course the alternate plates; the other ten were connected with the opposite end. The acting surface of each electrode, including both sides of each plate, was something more

than 3 square feet. The electrodes for batteries of high intensity are also parallel and separated from each other, about one-sixteenth of an inch, by a non-conductor. But the two outside or terminal plates only are connected with the battery; one with the negative, the other with the positive end. The terminal plate, which is connected with the top iron plate of the voltameter, must be covered on the outside by a non-conductor, otherwise the voltaic current would pass to the side of the iron vessel, and would not pass through the plates and fluid interposed between the two outside or terminal plates. The cells between each pair of plates must be made nearly water-tight, and must be open only on the top, in order that when the terminal plates are connected with the battery, the voltaic current may have no way of passing from one end of the battery to the other but through the interposed plates and fluid. In each plate there should be a small hole near the bottom, that the cells may always remain nearly filled with the fluid. The fluid should never rise above the upper edge of the electrodes, otherwise a great part of the galvanic current would be transmitted by it from one terminal plate to the other without passing through the interposed plates or fluid. The number of cells formed by the interposed plates should be about one-fourth of the number of cells in the battery. Thus for a battery of 12 cast-iron cells, there should be 3 cells or 2 plates between the two terminal plates. For a battery of 100 cast-iron cells in series, there may be 25 decomposing cells or 24 interposed plates. A battery of 100 cells has twenty-five times the intensity of a battery of 4 cells, therefore the current from it will overcome twenty-five times as much resistance as the current from 4 cells, and will pass through 25 decomposing cells successively as freely as a current from a battery of 4 cells will pass through a single decomposing cell. If the current from a battery of a hundred well *insulated* cells be sent through 25 decomposing cells, and afterwards through the coil of a galvanometer, which coil is made of thick copper wire, it will be found that the deflexion of the needle will be equal to that which will be produced by a current from a battery of 4 cells passing through one decomposing cell and through the coil of the same galvanometer. Hence there is as much of the mixed gases produced in each of the 25 decomposing cells as in the single cell through which the current from the battery of four cells passed, that is, twenty-five times as much of the mixed gases as is produced by a battery of four cells. Hence the full decomposing power of a battery of a hundred cells is exerted; and because the intensity of the current is reduced to that of a battery of four cells, the power of the battery is not exhausted more rapidly than if it consisted of four cells in series. If the current of a battery of a hundred cells in one series were sent through the electrodes as they are commonly arranged, the power of the battery would be exhausted about twice as soon as if the current passed through the electrodes arranged for batteries of high intensity, and the twelfth part of the full decomposing power of the battery would not be effective. To those who wish to show with the same battery the deflagrating power of the voltaic current, the coke light, and the decomposition of water, and the lime light, an arrangement of the electrodes similar to that which has been just described will be useful, because a battery arranged for intensity will answer for all these effects.

But when a battery is put up for the sole purpose of decomposing water, it is better to arrange the cells in such a way that the intensity may not exceed that of four cells in series; because if a battery of 100 cells be arranged in series, a single bad porous cell or bad zinc plate will diminish considerably the power of the entire battery; but if the 100 cells be arranged in twenty-five rows, each containing four cells, and all the terminal zinc plates be connected so as to act as one plate, and all the end iron cells be connected so as to act as one, a bad porous cell or zinc plate will diminish the power only of the row to which it belongs, but not of the other rows.

(To be Continued.)

For the Journal of the Franklin Institute.

Particulars of the Steamers Gen. Santa Anna and Iturbide.

New York.—Hulls built by J. A. Westervelt & Co. Machinery by T. H. and E. Faron. Intended service, Mexican Government.

HULL.—

Length on deck,	160 feet.	
Breadth of beam at midship section,	28 "	4 inches.
Depth of hold,	14 "	3 "
Length of engine and boiler space,	40 "	
Draft of water at load line,	11 "	
" " below pressure and revolutions,	11 "	
Tonnage, 540.		
Area of immersed midship section at this draught,	226 feet.	
Masts and rig— Barque.		

ENGINES—oscillating.

Diameter of cylinder,		36 inches.
Length of stroke,	2 feet.	9 "
Maximum pressure of steam in pounds (estimated) 30.		
Steam cut off at half stroke.		
Maximum revolutions per minute, 35.		
Weight of engines *in pounds*, 80,000 estimated.		

BOILERS—Two—single return flue.

Length of boilers,	18 feet.	3 inches.
Breadth "	8 "	6 "
Height " exclusive of steam chimney,	9 "	6 "
Weight of " *in pounds*, 50,000—Estimated—without water.		
Number of furnaces in each boiler, 2.		
Length of grate bars,	6 feet.	
Area of upper flues in each boiler,		1008 sq. ins.
" lower " " "		1225 "
Length of flues,	21 feet.	
Fire surface,	1800 "	
Diameter of smoke pipes,	4 feet	9 inches.
Height " "	37 "	
Description of coal, Bituminous.		
Consumption of coal per hour (estimated) 900.		

PROPELLER.—

Diameter of screw,	10 feet	3 inches.
Length of blades,	2 "	7 "
Pitch of screw,	17 "	
Number of blades, 3.		
Average revolutions per minute, 90.		

Remarks.—Floor timbers at throat, *molded* 1 foot 2 inches. *Sided* 7 × 8 inches. Distance of frames *apart at centres*, 2 feet. Hull, of live oak; floors not filled in solid.

For the Journal of the Franklin Institute.

Particulars of the Steamer Clyde.

Hull built by Scott, Sinclair & Co. Machinery by the same firm. Intended service, New York to Glasgow.

HULL.—

Length on deck,	250 feet.	
Breadth of beam,	31 "	3 inches.
Depth of hold,	21 "	
Draft of water at load line,	17 "	
" " below pressure and revolutions,	15 "	
Masts and rig—	Three masted brigantine.	

ENGINES—Inclined athwartship—Geared 2½ to 1.

Diameter of cylinder,		52 inches.
Length of stroke,	3 feet.	10 "
Pressure of steam in pounds,	12.	
Revolutions per minute,	34.	

BOILERS—Four—tubular.

Number of furnaces,	12.
Description of coal,	Bituminous.

PROPELLER.—

Diameter of screw,	12 feet.
Pitch of "	15 "
Number of blades,	3.

Remarks.—Frames, *shape and dimensions* ⌐ $5\frac{1}{4} \times 3 \times \frac{1}{2}$ inches; *distance paart at centre* 15 inches. Plates, *thicknesses*, 1 inch to $\frac{5}{8}$ths. Keelsons, *number and dimensions* 3, one a box keelson, and two ⌐ on the sides. Is cieled with wood to turn of bilge. Is clincker built and abut riveted.

Translated for the Journal of the Franklin Institute.

New process in the making of Glass for Achromatic Lenses for Telescopes.

By M. DE PEYRONY.

Marshall Vaillant presented in the name of the author, M. de Peyrony, Captain of Engineers at Cherburg, a memoir upon a new process in the manufacture of the glass of which the lenses of astronomical telescopes are made.

In the present state of this manufacture, the mass of the glass having been brought to a state of fusion in the crucible, the material is simply stirred to make it homogeneous and drive out the air included in it; but this double object is never completely obtained, and the stirring, as it is performed, itself occasions the formation of numerous striæ, which compels the rejection of a large part of the glass taken from the crucible, as unfit for the formation of lenses. Hence the difficulty of obtaining lenses of large dimensions.

M. de Peyrony thinks that he has found the solution of this difficulty; that is to say, a way of making glass free from faults, by giving to the crucible containing the fused mass, a somewhat rapid motion of rotation around a vertical axis; the centrifugal force will, according to him, unite the air bubbles towards the centre of the glass, while the striæ made by

stirring, will, for the most part, disappear, and those that remain will be circular, and be productive of no inconvenience, if care be taken to make the axis of the primitive mass, the axis of the lenses.

Comptes Rendus de l'Academie des Sciences, vol. xxxviii, p. 874.

REMARKS.—The improvement by this process is not patent. The central part of the mass which it is proposed to throw away, is precisely the part which it is most desirable to preserve. And the idea of constructing a lense around an axis of the mass which is cut out as good for nothing, is probably more remarkable for novelty than excellence.—ED.

For the Journal of the Franklin Institute.

Particulars of the Steamer Cleopatra.

Hull built by Wm. Denny and Brother, Dumbarton. Machinery by Tullock & Denny. Intended service, Liverpool to Portland and Montreal.

HULL.—		
Length on deck,	228 feet.	
Breadth of beam at midship section,	32 "	
Depth of hold,	25 "	2 inches.
Length of engine and boiler space,	63 "	
Tonnage,	1138.	
Masts and rig,—	Ship.	
ENGINE.—Vertical beam.		
Diameter of cylinder,		62 inches.
Length of stroke,	4 feet	6 "
Maximum pressure of steam in pounds,	10.	
Weight of engine,	150 tons.	
BOILERS—Two—tubular.		
Length of boilers,	9 feet.	
Breadth "	12 "	9 inches.
Height " exclusive of steam chimney,	12 "	4 "
Weight of " without water,	150 tons.	
Number of furnaces,	8.	
Length of grate bars,	6 feet.	6 inches.
Number of tubes,	580.	
Internal diameter of tubes,		$3\frac{1}{4}$ inches.
Length of tubes,	6 feet.	
Diameter of smoke pipes,	5 "	11 inches.
Height, "	40 "	
Description of coal,	Bituminous.	
PROPELLER—		
Diameter of screw,	14 feet.	
Pitch,	18 "	
Number of blades,	2.	

Remarks.—Frames, *shape and dimensions* ⌐ 5 by 3 inches and $\frac{9}{16}$ in.; *distance apart at centres*, 18 inches—Plates *thicknesses* $\frac{3}{4}$ $\frac{11}{16}$ $\frac{9}{16}$ and $\frac{1}{2}$ inches. Has 6 water-tight bulk heads, clincker built, with abut riveted.

Translated for the Journal of the Franklin Institute.

Lighting by Electricity. Letter of MM. DELEUIL & SON, to M. ELIE DE BEAUMONT.

We communicated to the Academy, some time ago, a note in reference to the electro-lighting of the Napoleon Docks. M. Regnault, the

Director of the telegraph of the Rouen Railroad, who took charge of this lighting, has communicated to us the statement of the expense, of which we herewith send you the details.

We thought that every thing connected with this lighting would be favorably received by the Academy. The apparatus which worked for four consecutive months with great regularity, were composed each of a battery of fifty Bunsen elements of large size.

The expense per day apparatus, was as follows:

Wages of the workmen,	4·50	francs.
Mercury,	5·	"
Zinc,	4·50	"
Charcoal points,	1·40	"
Nitric Acid,	1·80	"
Sulphuric Acid,	1·84	"
	19·04	" ($3·80.)

The expense of lighting 400 workmen was, then, 38·08 francs ($7·62) per evening, or 1·9 cents per man. The economy is considerable, and the work can be done without danger and with a regularity which cannot be obtained by any other means.

The Perpetual Secretary remarked, that electro-lighting, which could be very cheaply established on ship-board, and which is not, like other systems of lighting, liable to be extinguished during a storm, would be very advantageous for preventing those collisions by night, which are so frequent, and generally so disastrous, and to which attention has been called by a recent event.—*Comptes Rendus de l'Academie des Sciences, (Paris,) 1st May*, 1854.

FRANKLIN INSTITUTE.

Proceedings of the Stated Monthly Meeting, July 20, 1854.

Dr. B. H. Rand, President, pro. tem., in the chair.

Owen Evans, Corresponding Secretary, pro tem.

Isaac B. Garrigues, Recording Secretary.

The minutes of the last meeting were read and approved.

Letters were read from the Royal Institute of British Architects, London, and the Smithsonian Institution, Washington City, D. C.

Donations to the Library were received from the Smithsonian Institution, Washington City, D. C.; John McRea, Esq., Charleston, S. Carolina; Paul K. Hubbs, Esq., California; the Pennsylvania Legislature: B. F. Palmer, Esq., Prof. John F. Frazer, and the Councils of the City of Philadelphia.

Donations to the Cabinet of Minerals from James H. Bulkley, Esq.

The periodicals received in exchange for the Journal of the Institute were laid on the table.

The Treasurer's statement of the receipts and payments for June was read.

The Board of Managers and Standing Committees reported their minutes.

Resignations of membership in the Institute, by two gentlemen, were read and accepted.

New candidates for membership in the Institute (4) were proposed, and the candidate proposed at the last meeting was duly elected.

Washington Jones exhibited to the meeting some specimens of scale, or incrustation, taken from the boiler of a coasting steamer. One piece about twelve inches long, by eight wide, and about three-eighths thick, was formed on the outer portion of the furnace crown, and distinctly showed the form of that part of the boiler, with each rivet head and the joinings of the sheets. The scale had been deposited in layers that were of various tints, derived from the coloring matter extracted from the substances (such as saw-dust of mahogany, &c.,) that had, from time to time, been put into the boiler to prevent the deposit of scale. Another piece, of irregular shape, had been taken from the steam chimney. It is well known that scale is a non-conductor of heat. It forms most rapidly, as a necessary consequence, upon those parts of the boiler where the heat and the evaporation is the greatest, and thus increases the liability these parts have to become overheated or burned.

Mr. Jones also presented a stay bolt taken from the smoke pipe, where its head had been for over two years exposed to jets of exhaust steam. The part of the head against which the steam impinged, had been cut or worn away by its action; the texture of the iron was close, and the wasted part was as smooth as if cut with a keen tool.

Mr. Jones remarked that the proper construction and maintenance of steam boilers in a safe condition, should be of special importance not only to engineers, but to the whole community. No part of the apparatus requires closer attention. As a class, our steamboat engineers are fully competent to discharge the duties belonging to their post; but, occasionally, the desire to make a quick run, induces them to carry a little higher steam, and to "blow out" less frequently, a practice to be deprecated, as it is almost sure to bring upon them the labor of "scaling," as well as risking the efficiency of the boilers.

Mr. Jones also called the attention of the members to a simple contrivance for communicating rotary motion without the aid of toothed wheels or belts, invented by Mr. Joseph Thatcher, of Philadelphia. It is believed to be new, and consists of a rigid bar whose ends are fitted to the pins of cranks secured on the shafts that are intended to transmit and receive the motion. In the middle of the bar is a slotted hole, of a length rather more than the throw of the cranks. A stationary pin is secured in line with the centres of the two shafts, and (in the present instance,) equi-distant from them. Upon this pin the slotted lever is free to slide in the direction of its length. When one shaft is turned from right to left, the crank pin carries the attached end of the bar with it; the fixed pin in the slotted hole preventing any motion sideways, the other end of the bar is obliged to move in an opposite direction, or from left to right; the motion of the bar gradually changes from a vibratory, to one in the direction of its lengths, and vice versa. The model shown worked freely, no undue friction being apparent.

The inventor has applied this apparatus to gas metres, and his application is at present under consideration by the Committee on Science and the Arts.